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Hearing protectors - Recommendations for selection, use, care and maintenance -
Guidance document

Gehörschützer - Empfehlungen für Auswahl, Einsatz, Pflege und Instandhaltung -
Leitfaden

Protecteurs individuels contre le bruit - Recommandations relatives à la sélection, à
l'utilisation, aux précautions d'emploi et à l'entretien - Document guide

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EUROPEAN STANDARD

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Hearing protectors - Recommendations for selection, use, care and maintenance - Guidance document

Protecteurs individuels contre le bruit -
Recommandations relatives à la sélection, à
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Pflege und Instandhaltung - Leitfaden

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European foreword

This document (EN 458:2025) has been prepared by Technical Committee CEN/TC 159 “Hearing protectors” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2026, and conflicting national standards shall be withdrawn at the latest by June 2026.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 458:2016.

The main changes compared to the previous edition are listed in Annex I, Table I.1.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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Introduction

This document is intended to guide employers, supervisors and safety advisors. Additionally, this document gives information to all who need to use hearing protectors.

Hearing protectors are intended to protect against the risk of harmful noise and are elevated into the highest risk Category III under the Personal Protective Equipment Regulation (EU) 2016/425, which can cause irreversible health effects or can be potentially life threatening. They are intended to reduce the harmful effects that sound and noise can have on the hearing of an individual. Requirements for hearing protection products are given in the EN 352 series.

Guidance is provided on how to best select, use and maintain hearing protectors and check for compatibility for other equipment (e.g. Personal Protective Equipment (PPE), communication devices and hearing aids). Calculation procedures to estimate the residual noise exposure level, when a certain hearing protector is used, are also provided.

National bodies can develop their own local application documents based on this document.

Hearing protectors are generally available in two main forms: earmuffs and earplugs. Both forms are available with additional features and functions. All have their advantages and disadvantages in terms of attenuation, comfort, ease of use, communication facilities and cost.

In hearing conservation programmes noise hazard areas are identified and the personal noise exposure is assessed. Before a suitable hearing protector is considered, priority should be given to reducing noise at source and/or reducing the exposure time.

If the use of a hearing protector is found necessary or advisable, choosing optimum devices is a complex task. The most important aspects for hearing protector performance include sufficient attenuation and usage during the entire exposure period.

It is often desirable to retain the ability to hear speech and warning signals. If the hearing protector is a passive device only, the hearing protector should not provide excessive attenuation (over-protection), which can create a feeling of isolation and difficulties with perception of important sounds. In particular, this needs attention at moderate noise levels.

Hearing protectors are supplied with attenuation data in various formats. The attenuation is expressed in decibels and has been derived from laboratory tests. It is important to note that these data have been achieved under controlled laboratory conditions using trained test subjects. Under real working conditions, the attenuation achieved by the user can be lower than that generated by the laboratory testing.

The performance of hearing protectors is subject to natural variability in the anatomy amongst users. Correct fitting, training, regular inspection and user motivation are important to obtain the desired protection. Due to the natural variability, it is not possible to calculate the exact attenuation that a certain hearing protector will give for an individual. If a more accurate prediction is required, an individual fit test is strongly recommended. At high noise level exposures it is advisable to seek expert advice. In some cases dual protection, i.e. the use of an earmuff and an earplug combination, can be required.

For hearing protectors to be effective they should be used at all times when the user is in a potentially hazardous noise environment. When selecting hearing protectors, attention should be given to factors influencing comfort and user preference.

This document also provides advice on how to consider sustainability.

1 Scope

This document gives recommendations for the selection, use, care and maintenance of hearing protectors.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 352-6, *Hearing protectors — Safety requirements — Part 6: Earmuffs with safety-related audio input*

EN 352-8, *Hearing protectors — Safety requirements — Part 8: Entertainment audio earmuffs*

EN 352-9, *Hearing protectors — Safety requirements — Part 9: Earplugs with safety-related audio input*

EN 352-10, *Hearing protectors — Safety requirements — Part 10: Entertainment audio earplugs*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 daily noise exposure level

$L_{EX,8h}$

A-weighted noise exposure level normalized to a nominal 8 h working day according to EN ISO 9612

3.2 peak sound pressure level

$L_{p,Cpeak}$

C-weighted instantaneous peak sound pressure level according to EN ISO 9612

3.3 national regulation level

L'_{NR}

daily noise exposure level ($L_{EX,8h}$) effective to the ear according to national regulations

Note 1 to entry: National laws or regulations determine the levels of exposure at which hearing protectors are provided or used.

3.4 national peak regulation level

$L'_{NR,peak}$

peak pressure level $L_{p,Cpeak}$ effective to the ear according to national regulations

Note 1 to entry: National laws or regulations determine the levels of exposure at which hearing protectors are provided or used.

EN 458:2025 (E)**3.5****effective attenuation**

measure of protection afforded by the hearing protector for the user

3.6**A-weighted sound pressure level**
 $L_{p,A}$

sound pressure level with frequency weighting A according to EN 61672-1

3.7**A-weighted sound pressure level effective to the ear**
 $L'_{p,A}$

A-weighted diffuse-field related sound pressure level under the hearing protector for the external sound pressure level $L_{p,A}$

3.8**C-weighted sound pressure level**
 $L_{p,C}$

sound pressure level with frequency weighting C according to EN 61672-1

3.9**A-weighted equivalent sound pressure level effective to the ear**
 $L'_{p,A,eqT}$

A-weighted diffuse-field related equivalent sound pressure level under the hearing protector for the external equivalent sound pressure level for time period T , $L_{p,A,eqT}$

Note 1 to entry: For simplicity of notation, the subscript T is omitted throughout the following text.

3.10**daily noise exposure level effective to the ear**
 $L'_{EX,8h}$

A-weighted diffuse-field related equivalent sound pressure level under the hearing protector for the external daily noise exposure level $L_{EX,8h}$

3.11**peak sound pressure level effective to the ear**
 $L'_{p,C,peak}$

C-weighted peak sound pressure level under the hearing protector for the external sound pressure level $L_{p,C,peak}$

3.12**flat frequency response**

attenuation which is constant (or nearly constant) over the frequency range between 125 Hz and 8 000 Hz

Note 1 to entry: The slope of the linear regression of mean attenuation values from 125 Hz up to 4 000 Hz fulfils the criterion proposed by Liedtke [25] with a value lower than 3,6 dB, or very approximately $H - L < 9$ dB. See A.1 for explanation of "H" and "L".

3.13**fit testing**

<hearing protectors> procedure for checking that a specific hearing protector is suitable for use by a specific individual by assessing the physical fit, seal, sound attenuation or other properties of the hearing protector

[SOURCE: EN 17479:2021, 3.1]

3.14

personal attenuation rating

PAR

individual attenuation given as a single value in dB that a user obtains for the fit of the hearing protector that was tested

Note 1 to entry: The PAR can be either the combined left-right (binaural) or separate left-right ear value.

Note 2 to entry: The calculation procedure is not standardized and is specified by the manufacturer for a specific fit testing method.

[SOURCE: EN 17479:2021, 3.4]

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

f	centre frequency of the octave band in Hz
$L_{p,eq}$	equivalent sound pressure level
$L_{p,oct}$	sound pressure level for a single octave band
$L_{p,oct,eq}$	equivalent sound pressure level for a single octave band
PNR	predicted noise level reduction according to EN ISO 4869-2
APV_f	assumed protection value $APV_{\beta 4}$ according to EN ISO 4869-2
H	high-frequency attenuation value
M	middle-frequency attenuation value
L	low-frequency attenuation value
SNR	Single Number Rating
rms	root mean square
$L_{EX,8h}$	daily noise exposure level
$L_{p,C,peak}$	C-weighted peak sound pressure level
L'_{NR}	national regulation level
$L'_{NR,peak}$	national peak regulation level
$L_{p,A}$	A-weighted sound pressure level
$L'_{p,A}$	A-weighted sound pressure level effective to the ear
$L_{p,C}$	C-weighted sound pressure level
$L_{p,A,eqT}$	A-weighted equivalent sound pressure level
$L_{p,C,eqT}$	C-weighted equivalent sound pressure level
$L'_{p,A,eqT}$	A-weighted equivalent sound pressure level effective to the ear
NOTE	For simplification of notation, the subscript T is omitted throughout the following text.
$L'_{EX,8h}$	daily noise exposure level effective to the ear

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$L'_{p,Cpeak}$	peak sound pressure level effective to the ear
$L_{C,Fmax}$	maximum value of the sound pressure level with time-weighting F (fast) and frequency weighting C
$L_{A,Fmax}$	maximum value of the sound pressure level with time-weighting F (fast) and frequency weighting A
A_f	frequency weighting A in dB for octave band centre frequency f
L_{crit}	criterion level
L_{max}	maximum input signal level to the protector audio input
U_{crit}	criterion voltage
U_{max}	maximum rms voltage input to the protector audio input
K	constant for corresponding national regulation level
n	maximum number of hours for use of audio input
PPE	personal protective equipment
ANR	active noise reduction
REAT	real ear attenuation at threshold
d_m	modified sound attenuation value

5 Types of hearing protectors**5.1 Design forms****5.1.1 Earmuffs**

Earmuffs consist of cups which fit over the ears and are sealed to the head with soft cushions, usually filled with foam and/or liquid. The cups are usually lined with sound absorptive material. They are connected by a tensioning band (head band), usually made of metal and/or plastic. When the earmuff is used behind-the-head or under-the-chin and has a mass in excess of 150 g, a flexible head strap is fitted to each cup or to the head band close to the cups to support the earmuff. Some earmuffs have one cup intended only for the left ear and the other only for the right ear. Earmuffs can be available in 'medium size range', 'small size range' and 'large size range' types. 'Medium size range' earmuffs will fit the majority of users. 'Small size range' or 'large size range' earmuffs are designed to fit users for whom 'medium size range' earmuffs are not suitable.

Earmuffs are available with head bands, neck bands, chin bands and universal bands. Earmuffs with neck bands and chin bands permit the simultaneous using of a safety helmet. Universal bands can be used over-the-head, behind-the-head or under-the-chin.

Requirements for earmuffs are specified in EN 352-1.

5.1.2 Earmuffs attached to head protection and/or face protection devices

Earmuffs attached to head protection and/or face protection devices (also called mounted earmuffs) consist of individual cups attached to arms that are mounted to a safety helmet or other equipment serving as carrier for the hearing protector, such as the rigid head top of a powered and supplied air respirator system. The arms are adjustable so that the cups can be positioned over the ears.

Requirements for earmuffs attached to head protection and/or face protection devices are specified in EN 352-3.

5.1.3 Earplugs

5.1.3.1 General

Earplugs are hearing protectors that are designed to be inserted into the ear canal or to cover the ear canal entrance. They are sometimes provided with an interconnecting cord (corded earplugs), rigid band or finger grips. Earplugs can be either disposable (intended for single use) or reusable (intended for repeated use). All types of earplugs except custom moulded earplugs can be available in a range of sizes.

Requirements for earplugs are specified in EN 352-2.

5.1.3.2 Pre-shaped earplugs

Pre-shaped earplugs can readily be inserted into the ear canal without prior shaping. Pre-shaped earplugs are available in a variety of materials.

5.1.3.3 User-formable earplugs

User-formable earplugs are made from compressible or malleable materials that the user forms before insertion. Compressible earplugs are designed to expand to form the seal within the ear canal after insertion.

5.1.3.4 Banded earplugs

Banded earplugs are pre-shaped earplugs attached to a band which presses them into the ear canal or against the entrance of the ear canal. Some are intended to be used in more than one position, e.g. with the band under-the-chin.

5.1.3.5 Custom moulded earplugs

Custom moulded earplugs are individually moulded to fit the shape of the user's ear canals typically using an impression or a scan of the concha and the ear canal of the user. They can be manufactured in a range of materials and with different acoustic filters to offer a range of attenuation.

5.2 Function mode

5.2.1 Basic function mode

All hearing protectors have the characteristics of reducing noise by their design and type of material used, to absorb and/or reflect sound. Devices that have only this function are called passive devices. They constitute the basis for all other additional function modes as described in 5.2.2 to 5.2.4.

5.2.2 Level-dependent hearing protectors

5.2.2.1 General

Level-dependent hearing protectors are designed to provide different attenuation as the external sound level changes. Their main purpose is to protect against impulsive or intermittent hazardous noise while allowing situational awareness.

5.2.2.2 Passive level-dependent hearing protectors

Passive level-dependent hearing protectors use the acoustic properties of carefully designed air ducts to give different attenuation depending on the noise level. These types of hearing protectors are designed to be effective against very high level single-impulse noises, such as firearms, rather than the continuous noise or repetitive impulses found in most industrial situations.

EN 458:2025 (E)**5.2.2.3 Sound-restoration level-dependent hearing protectors**

Sound-restoration level-dependent hearing protectors incorporate an electronic sound reproduction system. At low sound pressure levels, the sound detected by an external microphone is relayed to a loudspeaker inside the earmuff or earplug. As the external sound pressure level increases, the electronics reduce the gain and control the level of reproduced sound inside the hearing protector.

Requirements for level-dependent hearing protectors are specified in EN 352-4 (for earmuffs) and EN 352-7 (for earplugs), e.g. minimum criterion levels.

There are two types of sound-restoration level-dependent hearing protectors: products only intended for use in impulsive type noise situations and products for all types of noise environment (continuous, fluctuating and intermittent noise including impulsive noise, see Annex G).

5.2.3 Active noise reduction (ANR) protectors

Active noise reduction protectors are hearing protectors which incorporate an electronic sound cancelling system to achieve additional noise attenuation where passive hearing protectors can be less effective. ANR is particularly effective for continuous noise at low frequencies (50 Hz to 500 Hz) (see Annex G).

Requirements for active noise reduction earmuffs are specified in EN 352-5.

5.2.4 Hearing protectors with external audio input**5.2.4.1 General**

These devices use a wired or wireless system through which communication signals, alarms, messages or audio entertainment can be relayed. Some products incorporate a system to limit the sound pressure level.

5.2.4.2 Hearing protector with entertainment audio input

These devices can incorporate a radio receiver set or music player for entertainment or allow audio input from external devices. The entertainment audio input is limited to 82 dB(A).

Requirements for entertainment audio hearing protectors are specified in EN 352-8 (for earmuffs) and EN 352-10 (for earplugs).

5.2.4.3 Hearing protector with safety-related audio input

These devices include wired or wireless input and/or built-in two-way radio and can be used for work-related or safety-related communication. As the information to be received might be crucial for safety, the product standards impose no limitation on the reproduced sound pressure level at the ear.

Requirements for hearing protectors with safety-related audio input (for work or safety-related communication) are specified in EN 352-6 (for earmuffs) and EN 352-9 (for earplugs).

6 Selection**6.1 Principles**

Personal hearing protection should be selected so that, when used correctly and for the entire duration of exposure, it will eliminate or minimize the risk to hearing.

As there are many different hearing protectors intended for use in a wide range of noise environments it is important to choose a suitable type. The product shall be checked for regulatory conformance. Consideration should be given to the factors listed in a) to h). The list is neither exclusive nor exhaustive:

- a) sound attenuation, see 6.2;
- b) work environment, see 6.3;
- c) essential work or safety-related communication, especially speech intelligibility, see 6.4;
- d) compatibility with other personal protective equipment (PPE), such as helmets, spectacles, etc., see 6.5;
- e) the interaction between the user and the situation of use, see 6.6;
- f) medical factors, see 6.7;
- g) user comfort and ergonomic requirements, see 6.8;
- h) sustainability aspects of the products, see Clause 9.

The selection procedure should be reviewed at regular intervals to ensure that an effective attenuation is maintained. When considering all factors in the selection process the most important outcome is that the hearing protector will be used during the whole time of noise exposure.

6.2 Selection according to sound attenuation

6.2.1 Guide to protection rating

Hearing protectors should be chosen according to the sound attenuation they will provide. Methods to predict the sound attenuation of hearing protectors are given in 6.2.3.

NOTE 1 It is generally accepted that the risk of hearing damage associated with occupational noise exposure is low where the daily noise exposure level ($L_{EX,8h}$) is below 80 dB, and insignificant where $L_{EX,8h}$ is below 75 dB.

NOTE 2 National regulations or other guidelines can stipulate selection criteria for personal hearing protection and place limits on sound exposure. Such relevant criteria and limits are often taken into account in deciding what level of sound attenuation is required.

In general, a hearing protector which provides an effective sound level at the ear ($L'_{p,A,eq}$) of between 70 dB and 80 dB is considered suitable. If the chosen hearing protector provides excessive attenuation, users are at risk of failing to recognize warning signals and understand essential communications. Users can also feel isolated from their working environment. The perception of isolation increases as the sound level effective to the ear decreases.

Workers can be exposed to different noise environments during the working day. It can be possible to select a single hearing protector which is adequate for all situations likely to be encountered, or in some situations, to select more than one type of hearing protector.

EXAMPLE 1 A worker's only significant noise exposure is to an $L_{p,A,eq}$ of 98 dB, for a total of 30 min per day. His $L_{EX,8h}$ is 86 dB. His employer wishes to minimize the risk to the worker's hearing, and so aims to provide a hearing protector that provides an effective sound pressure level at the ear of below 80 dB, ideally between 75 dB and 70 dB during the noise exposure. Using the *HML* check method, the employer selects a protector that provides a sound attenuation of $M = 26$ dB.

EXAMPLE 2 A worker spends the majority of her working day (a total of 6 h) in an environment with an $L_{p,A,eq}$ of 94 dB. Her $L_{EX,8h}$ is around 93 dB. Her employer wishes to reduce the effective $L'_{EX,8h}$ to at least below 80 dB, and to minimize the risk to the worker's hearing. The employer rejects a protector that provides a sound attenuation of $M = 32$ dB, as this would reduce the effective sound pressure level at the ear to 62 dB and so risk excessive attenuation. Using the *HML* check method, the employer selects a protector that provides a sound attenuation of $M = 22$ dB.