

BIAP Recommendation 09/6:

Functional testing of hearing protection earmoulds

General foreword

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Introduction

Loud sounds can permanently damage hearing.

Therefore the directive 2003/10/EC of the European Parliament and of the Council of February, 6th, 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise) applies for all EU member states. In many other states similar regulations exist.

If the risks arising from exposure to noise cannot be prevented by other means, appropriate properly fitting individual hearing protectors shall be used.

If the individual hearing protection is produced as a custom made earmould, an optimum sealing of the auditory canal has to be guaranteed for the required sound insulation.

If the sealing of the auditory canal is insufficient, the sound insulation is reduced.

In this case the required protection function of the earmould may not be given and could lead to damage of hearing.

Scope

This recommendation applies to all individually produced protection earmoulds for passive hearing protection systems with and without filter.

The recommendation also applies to all active and electronic hearing protection systems. The electronic function may have to be deactivated during a test if necessary.

This recommendation should also be valid for private used hearing protectors (private noise exposition).

Recommendation

The protection provided by the earmould can be guaranteed only if professional functional check at delivery and routine functional checks are carried out (functional fitting), provided that the first one is executed at delivery and further checks repeated at least every year (very important for people in loud environments with (unprotected) sound pressure levels higher than 85 dB_{A leq}).

Acoustic tests or pressure measurements¹ are applied on earmoulds fitted into the ear canal. The results of the acoustical test must be within the limits of the data sheet of the manufacturer.

Check upon delivery is the responsibility of the manufacturer in accordance with PPE Directive 89/686/EEC limiting marketing of products to products with sufficient protective effect.

For the periodical functional tests the employer/entrepreneur is responsible for regularly checking the condition of the hearing protectors in accordance with the Noise Directive 2003/10/EC.

The tests themselves may only be carried out by qualified persons. The BIAP recommends that qualified persons are hearing aid professional or industrial physician.

Only under these conditions a secure sound protection by the earmould can be expected. The results must be certified and provided to the employer/entrepreneur.

¹ At release time of this recommendation three different testing methods are known by the authors:

- Acoustic test with pure tone audiometry via circumaural headphones with and without the hearing protector. The hearing threshold difference is the effective protection value of the hearing protection system in dB. Pro: the sealing by the earmould and the acoustical function of the filter is tested. Contra: time consuming audiometry tests.
- Acoustic test with the ELACIN® Seal Integrity Meter (SI-Meter) (developed in close cooperation with Etymotic Research). This in situ based system uses a test sound only within the frequency range 200 - 400 Hz and shows the difference between the probe microphone and the reference microphone as the sealing value of the earmould in dB steps. Pro: very fast testing. Contra: for this test the filter has to be removed from the earmould. Only the fit and sealing of the earmould is tested, not the acoustical function of the filter.
- Pressure measurement. Soft air pressure is applied to the earmould via a tube/adapter. The test instrument shows the seal of the earmould or a possible leak. Pro: very fast testing. Contra: for this test the filter has to be removed from the earmould. Only the fit and sealing of the earmould is tested, not the acoustical function of the filter.

This is not a rating of the different testing methods. Comparison studies to this topic are unknown by the authors.

References

Council Directive 89/686/EEC of 21 December 1989 on the approximation of the laws of the Member States relating to personal protective equipment

Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise) (Seventeenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)

DGUV (German Social Accident Insurance) Prevention Guidelines (in German) "The usage of hearing protection earmoulds - otoplastics", September 2010 (10. functional testing of hearing protection earmoulds - otoplastics)

This recommendation was created and approved in a multidisciplinary cooperation between professionals of all audiophonologic disciplines, which are medicine, pedagogy, speech therapy, psychology and hearing instrument audiology.

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