

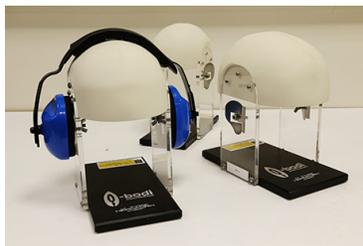
# EN 352-1:2002

## Hearing protectors. General requirements Part 1: Ear-muffs



### Materials and construction

It must be ensured that the materials used in the manufacture of the device, which will come into contact with the skin, are non-staining and not likely to cause skin irritation, allergic reaction or any other adverse effect on health. The materials and construction assessment also confirms that the device is free from sharp edges, safe for use and that the cleaning and disinfection methods specified cause no damage or impairment to the hearing protection.



### Sizing and adjustability

The sizing and adjustability of ear-muffs is assessed to ensure that the product is suitable for the range of head sizes designated by the manufacturer. This test is conducted using a fitting rig, which allows the confirmation that the product can provide an adequate fit for the intended consumer.



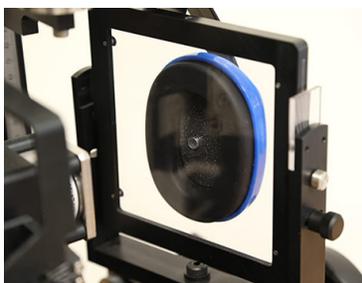
## Cup rotation

The rotation of the cups is measured to assess whether or not it is sufficient. There must be enough rotation available for wearers to adjust the device for the best fit.



## Headband force

The headband force of the device is measured using a force rig to ensure that there is no excessive force on the wearers head, and so that the change in headband force can be calculated after the testing and conditioning scheme is complete.



## Cushion pressure

The cushion pressure is assessed to ensure that there is no excessive pressure upon the wearers head.



## Resistance to damage when dropped

Resistance to damage is evaluated by dropping the hearing protection from a specified height onto a solid steel plate. If any part of the sample tested cracks or breaks then the device will fail the test. For devices which are designed for use in colder environments, this testing can

also optionally be conducted at -20°C.



## Change in headband force

After the tests detailed above have been completed, the headbands of the ear-muffs are subjected to headband flexing for 1000 cycles using a flexing rig, before being conditioned in a water bath at 50°C for 24 hours. Once complete, the headband force is measured for a second time, with a maximum deviation between the two measurements providing the pass criteria.



## Insertion loss

Insertion loss is the algebraic difference between the sound pressure level with and without the ear-muff fitted to a test fixture. This test does not use human subjects, instead an acoustic test fixture, which simulates the approximate dimensions of the human head is used. It is worth noting that this test sets no limit on the minimum attenuation which should be achieved; it is designed to assess the standard deviation of the attenuation values to ensure that there is not a major variation in performance between 10 samples of the same ear-muff model.

## Resistance to leakage



If ear-muffs with fluid filled cushions are under test, then resistance to leakage must be assessed. A vertical load of  $28 \pm 1$  Newtons is applied to the cushion for 15 minutes and any leakage caused will constitute a test failure.



## Ignitability

A steel rod heated to around  $650^{\circ}\text{C}$  is applied to the device. If any part ignites or continues to glow after the removal of the rod then the device will fail the ignition test.



## Minimum attenuation

The subjective attenuation testing actually uses human subjects to assess the performance of a hearing protection device, and does carry a minimum attenuation value to pass the test. The results of these tests are the ones which will be published for the model when it is placed on sale and will be supplied to wearers. This test measures the threshold of hearing, the lowest sound pressure level perceivable by the ear, of 16 human test subjects with and without the hearing protection worn. It is then possible to calculate the performance of the model from these values.

## Marking

Marking of the device is then inspected. This is an examination of the final product to ensure that the correct markings are present, as

specified in the relevant European Standard.

## Information supplied by the manufacturer

The information provided to wearers is then examined. This involves a review of the supplied user manuals to ensure that the required information is supplied to users, as specified in the relevant European Standard.

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## Resources

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