

# Testing of Hearing Protectors

Test item(s): **AK5850BH / AK5850BHS Earmuffs**

Type: **Earmuffs with headband**

Customer: **A-Kabel AS  
Nedre Hagaveg 15 C  
2150 Årnes  
Norway**

Applied method(s): **EN 352-1:2020, EN 13819-1:2020 and EN 13819-2:2020**



**Antti Pihkamäki**  
Testing Engineer



**Jani Raami**  
Research Engineer



This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>

Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.<sup>1</sup> Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

## 1. Description and identification of test item(s)

Following samples were submitted and identified by the customer as:

Tested items: AK5850BH / AK5850BHS earmuffs



Pictures of AK5850BHS earmuffs

## 2. Scope of testing

Testing date/s: 2021-08-26 - 2022-01-21

Tests were performed at the PPE laboratory of SGS Fimko Oy under accreditation scope.

All tests except ignitability and mass of the earmuffs were performed at Topeliuksenkatu 41b, 00250 Helsinki, Finland

The ignitability and mass of hearing protector were performed at Takomotie 8, 00380 Helsinki, Finland

Following tests were requested by the customer:

Requirement		Test method
Mass of the earmuffs	-	EN 13819-1:2020 4.1.3.3
Materials and construction	EN 352-1:2020 4.2.1 and 4.2.2	-
Sizing and adjustability	EN 352-1:2020 4.3.2	EN 13819-1:2020 4.2
Cup Rotation	EN 352-1:2020 4.3.3	EN 13819-1:2020 4.3
Headband force	EN 352-1:2020 4.3.4	EN 13819-1:2020 4.4
Cushion pressure	EN 352-1:2020 4.3.5	EN 13819-1:2020 4.5
Resistance to damage when dropped	EN 352-1:2020 4.3.6	EN 13819-1:2020 4.6
Headband flexing	Specimens do not break.	EN 13819-1:2020 4.8
Change in headband force	EN 352-1:2020 4.3.8	EN 13819-1:2020 4.1.3.7 g)
Insertion loss	EN 352-1:2020 4.3.9	EN 13819-2:2020 4.1
Ignitability	EN 352-1:2020 4.3.11	EN 13819-1:2020 4.13
Minimum sound attenuation	EN 352-1:2020 4.3.12	EN 13819-2:2020 4.2 *

\* except for the measurement order which is performed in the order of open-occluded.

## 2.1 Sampling and conditioning

Receiving date: 2021-08-26

Condition: Intact

Sampling method: The customer supplied all samples.

## 3. Test results

### 3.1. Mass of the earmuffs

Mass of ten specimens was measured and the mean mass was calculated. The mean mass of the earmuffs was 416 g.

### 3.2 Materials and Construction

Parts of the earmuffs that come into contact with the skin were non-staining, soft and pliable. The product was visibly unimpaired after cleaning and disinfection. According to visual inspection all parts of the product were rounded, finished smooth and free from sharp edges. The changing of cushions did not require the use of tools.

### 3.3 Sizing and Adjustability

Six specimens were measured for small (S), medium (M) and large (L) head dimensions:

Test Height (mm)	Width (mm)		
	125	145	155
115	S	S/M	-
130	S/M	S/M/L	M/L
140	-	M/L	L

  

Test height (mm)	Width (mm)		
	125	145	155
115	fail	ok	-
130	ok	ok	ok
140	-	ok	ok

Ear-muffs were compatible for medium and large sizes.

### 3.4 Cup Rotation

The ability of the cups to accommodate a range of angular movements was tested from six specimens for large dimension. The contact between the cushions of the specimens and the plates was continuous for large size.

### 3.5 Headband force

Headband forces were measured from six specimen for medium and large dimensions.

Specimen number	Headband force (N)	
	Medium	Large
1	14,8	13,4
2	15,1	13,5
3	15,1	13,5
4	15,1	13,5
5	14,7	13,5
6	15,4	13,5
Mean	15,0	13,5

The headband force shall not exceed 14 N.

### 3.6 Cushion pressure

Cushion pressure was measured from six specimens. For the large dimension cushion pressure was 3423 Pa. The cushion pressure shall not exceed 4500 Pa.

### 3.7 Resistance to damage when dropped

Resistance to damage when dropped was measured from six specimens. The specimens did not crack or become detached.

### 3.8 Headband flexing

Headband flexing was performed for six specimens. Specimens did not break during this test.

### 3.9 Change in the headband force

The change in headband force was measured using large size dimensions from the six specimens that were conditioned in room temperature (+22 ±5 °C) and humidity ≤ 85 % for 24 hours after headband flexing.

Specimen number	1	2	3	4	5	6	Mean
Change in headband force (%)	-3	0	-4	-2	-3	-6	-3

The headband force of each specimen shall not change by more than ±15 %.

### 3.10 Insertion loss

Ten samples results are tabulated below.

Frequency (Hz)	63	80	100	125	160	200	250	315	400	500	630
Mean IL (dB)	12,2	7,1	8,8	14,5	18,3	24,0	28,8	33,3	37,2	40,0	44,4
St. dev (dB)	2,5	1,1	1,2	1,3	2,1	1,0	1,0	1,3	1,7	1,9	2,5
Frequency (Hz)	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000
Mean IL (dB)	45,8	48,5	44,2	44,0	40,1	44,9	42,6	39,7	38,4	44,4	43,6
St. dev (dB)	2,3	2,6	3,6	1,3	2,6	1,5	1,4	0,9	1,3	1,2	1,1

The standard deviations shall be not greater than 4,0 dB in four or more adjacent one-third octave bands, and not greater than 7,0 dB in any individual one-third octave band.

### 3.11 Ignitability

Ignitability was tested from two specimens. Specimens did not ignite or continue to glow.

### 3.12 Minimum sound attenuation

Minimum sound attenuation of AK5850BH / AK5850BHS earmuffs were tested with 16 test persons.

Test subject	Individual data dB						
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
N.N. 1	18,3	24,2	35,0	42,9	31,3	38,8	45,4
N.N. 2	14,6	19,2	25,8	42,5	36,3	37,5	38,8
N.N. 3	25,8	33,3	30,4	42,5	28,8	36,7	43,3
N.N. 4	20,8	22,1	32,5	44,2	35,4	40,4	42,1
N.N. 5	17,9	20,4	28,3	43,8	32,5	38,8	40,8
N.N. 6	19,6	23,8	30,0	40,0	30,8	38,3	38,8
N.N. 7	17,5	26,7	31,3	37,1	28,8	41,2	37,5
N.N. 8	20,8	22,5	33,3	41,3	31,3	35,8	38,8
N.N. 9	20,0	22,1	25,4	41,7	30,0	38,8	42,5
N.N. 10	13,8	22,9	27,5	42,9	27,5	37,5	37,9
N.N. 11	18,8	25,8	32,9	40,4	26,7	34,2	32,9
N.N. 12	15,0	25,0	30,8	45,8	33,3	36,2	45,8
N.N. 13	15,4	22,1	31,7	40,0	32,5	42,9	38,7
N.N. 14	16,7	19,6	31,2	42,5	33,8	32,9	37,5
N.N. 15	18,8	25,4	27,1	36,3	27,9	37,1	38,3
N.N. 16	18,8	21,2	33,3	38,7	35,0	37,1	39,6

Minimum sound attenuation characteristics are tabulated below.

Frequency, Hz	125	250	500	1000	2000	4000	8000
Mean attenuation(dB)	18,3	23,5	30,4	41,4	31,4	37,8	39,9
St.dev. (dB) ( $\alpha=1$ )	3,0	3,4	2,9	2,6	2,9	2,5	3,3
APV (84 %)	15,3	20,1	27,6	38,8	28,4	35,3	36,6

Indices for SNR, H, M, and L are:

$H_{84} = 31,0$ dB	$M_{84} = 30,0$ dB	$L_{84} = 23,0$ dB	$SNR_{84} = 32,0$ dB
$H_m = 34,0$ dB	$M_m = 31,5$ dB	$L_m = 25,0$ dB	$SNR_m = 32,9$ dB
$H_s = 2,7$ dB	$M_s = 1,3$ dB	$L_s = 2,4$ dB	$SNR_s = 1,3$ dB

### 3.12.1 Requirements for minimum sound attenuation

HML minimum attenuation requirements is

H	M	L
12	11	9

In addition,  $APV_{f_{84}}$  octave band values shall be equal or greater than 0 (rounded to nearest integer):

AK5850BH / AK5850BHS earmuffs will satisfy these requirements.

#### 4. Summary

Test	Acceptance criteria according to	Comments
Mass of the earmuffs	No acceptance criteria	-
Materials and construction	EN 352-1:2020 4.2.1 and 4.2.2	Earmuffs meet the requirements.
Sizing and adjustability	EN 352-1:2020 4.3.2	Earmuffs meet the requirements for medium and large sizes.
Cup Rotation	EN 352-1:2020 4.3.3	Earmuffs meet the requirements for large size.
Headband force	EN 352-1:2020 4.3.4	Earmuffs meet the requirements for large size.
Cushion pressure	EN 352-1:2020 4.3.5	Earmuffs meet the requirements for large size.
Resistance to damage when dropped	EN 352-1:2020 4.3.6	Earmuffs meet the requirements.
Headband flexing	Specimens do not break.	Earmuffs meet the requirements.
Change in headband force	EN 352-1:2020 4.3.8	Earmuffs meet the requirements.
Insertion loss	EN 352-1:2020 4.3.9	Earmuffs meet the requirements.
Ignitability	EN 352-1:2020 4.3.11	Earmuffs meet the requirements.
Minimum sound attenuation	EN 352-1:2020 4.3.12	Earmuffs meet the requirements.

The statement of conformity in this test report is only based on measured values by the laboratory and does not take their uncertainties into consideration. The relevant uncertainty value is obtainable upon request from the laboratory.

**End of test report**