

CARACTERISTICAS TECNICAS DE LOS FILTROS ANTI-RUIDO, PRECIOS DE VENTA AL DISTRIBUIDOR Y P.V.P. ACONSEJADOS.



Opciones de filtros Alpine

El filtro blanco ofrece la máxima atenuación, el amarillo la mínima. Dependiendo de la situación, se puede optar por un juego de filtros en particular. La siguiente lista muestra el tipo de filtro ideal para diferentes situaciones.

	BLANCO F10	ROJO F8	VERDE F7	AZUL F6	AMARILLO F4
Industria pesada		X			
Pequeña industria				X	
Procesado de metales		X	X		
Industria maderera			X	X	
Imprenta					X
Conducción vehículos pesados	X				
Dormir			X		
Ronquidos	X				
Disparos, cazador	X				
Discoteca, conciertos					X
Limpieza alta presión (aire-agua)	X	X			
Motocicletas			X	X	
Concentración en el estudio	X	X			
Maquinaria domestica				X	

Cada oído es diferente, Estos ejemplos están tomados por guías de adaptación generales.

Valores de atenuación medidos de acuerdo al Standard EN 352-2: 1993

		125	250	500	1000	2000	4000	8000
F4 amarillo	m	2.1	3.9	10.5	18.5	29.4	30.1	32.4
	s	4.7	4.3	2.3	4	3.7	2.3	6.1
	APV84	0	0	8.2	14.5	25.3	27.8	26.3
F6 azul	m	6.8	9.7	14.9	21.7	30.5	32.7	34.4
	s	4.7	4.4	3.4	4	3.5	3.1	8
	APV84	2.1	5.3	11.5	17.7	27	29.6	26.4
F7 verde	m	15.1	16.9	20.2	26.3	31.6	32.8	36.8
	s	6.2	5.7	4.4	4.3	4.7	5.2	5
	APV84	8.9	11.2	15.8	21.9	26.9	27.6	31.8
F8 rojo	m	17.8	19.7	22.2	26	32.8	35.4	39.1
	s	5	5	4.1	5.5	3.5	3.6	6.6
	APV84	12.8	14.7	18.1	20.5	29.3	31.8	32.5
F10 blanco	m	25.8	26.2	26.9	28.8	34	39.3	39
	s	7.7	7.4	6.8	8.3	4.4	6	7.7
	APV84	18.1	18.8	20.1	20.5	29.6	33.3	31.3

Atenuación media (m), desviación Standard (s) y valor de protección asumido (apv), medidos en dB, bajo test de frecuencia entre 125 y 8000Hz.

	H	M	L	SNR
F4	22	11	4	14
F6	24	15	8	18
F7	27	19	14	23
F8	28	21	17	25
F10	28	22	20	26

Valores **H, M, L** y **SNR** de acuerdo al Standard ISO/DIS 4869-2, para el 84% de los casos, 1996 EN 352:93.

Para cualquier consulta adicional, póngase en contacto con su distribuidor.



DOCUMENTACION TECNICA

TEST DE HOMOLOGACION POR CADA MODELO DE FILTRO

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title
**TEST REPORT: CE type examination
of the Alpine AOP III custom moulded
ear plug**

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TEST REPORT: CE type examination of the Alpine AOP III custom moulded earplug

A. W. Bronkhorst

SUMMARY

A CE type examination has been performed for the Alpine AOP III custom moulded ear plug, in order to test whether the basic requirements for health and safety, in accordance with Annex II of the EC-directive 89/686/EC, are satisfied. The examination has been conducted using the test methods specified in EN 352-2 (1993) and EN 24869-1 (1990). It was found that the health and safety requirements were satisfied by the ear plug in combination with the following filters: F7, F8 and F10. For these filters, the SNR_{84} (single number rating of the attenuation), calculated according to ISO 4869-2 (1994), varies between 23 and 26 dB.

The sound attenuation of the Alpine AOP III custom-moulded earplug

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SUMMARY

The sound attenuation of the Alpine AOP III custom-moulded earplug, equipped with six acoustic filters, was determined according to ISO 4869-1 (1990) using sixteen subjects. The average sound attenuation and the standard deviation were determined at seven octave frequencies ranging from 125 Hz to 8000 Hz. In the report, the obtained results are both shown in tables and displayed graphically. They were used to calculate HML and SNR values according to ISO 4869-2 (1994). The SNR_x value (Single Number Rating) is the estimated difference between the C-weighted sound level outside, and the A-weighted sound level under the hearing protector, that is exceeded in x percent of all cases. The SNR_{84} values for the Alpine AOP III range from 12 dB (for the F2 filter) to 26 dB (for the F10 filter).

1 INTRODUCTION

Using the test methods specified in EN 352-2 (1993) and EN 24869-1 (1990), a CE type examination was performed for the Alpine AOP III custom moulded earplug, equipped with the following filters: F2, F4, F6, F7, F8 and F10. The ear plug is manufactured by Alpine Gehoorbescherming B.V., who is also the contractor for the type examination.

2 METHOD AND RESULTS

2.1 Materials, construction and cleaning

(paragraphs 5.1, 5.2 and 6.2 of EN 352-2)

As specified by the manufacturer, the material used in the ear plug has been used for 6 years without any evidence of skin problems. Examination of the plugs showed that they are not liable to cause physical damage to the wearer when fitted and used according to the manufacturer's instructions. It was found that a test panel of 16 users could readily insert and remove the ear plugs in/from their ear canals. The manufacturer supplies suitable packaging to ensure hygienic storage of the plugs between use. No changes were observed after cleaning ear plugs according to the instructions of the manufacturer, that would be expected to affect their physical properties or their performance.

2.2 Ignitability

(paragraphs 6.3 and 7.3 of EN 352-2)

According to the procedure described in EN 352-2 (1993), paragraph 7.3, the material of the ear plugs that is visible when worn was heated with a rod with a temperature of $650^{\circ}\text{C} \pm 20^{\circ}\text{C}$. It appeared that no tested part of the ear plug ignited or continued to glow after heating.

2.3 Sound attenuation

(paragraphs 6.5 and 7.5 of EN 352-2; EN 24869-1)

The sound attenuation of the ear plug (mean values and standard deviations) was measured in accordance with EN 24869-1 (1990).

2.3.1 Subjects

Sixteen paid subjects participated in the measurement of the sound attenuation. They all had hearing thresholds of at most 15 dB for frequencies of 2000 Hz and below, and at most 25 dB for frequencies above 2000 Hz. Furthermore, it was verified that for all subjects, the results of three consecutive threshold measurements, performed according to the procedure described in paragraph 2.3.4 below, did not differ more than 6 dB at any test frequency.

2.3.2 Fitting of the hearing protector

For all subjects, custom moulded ear plugs were made using imprints of both ear canals. It was ensured by the manufacturer that the delivered ear plugs satisfied his requirements with respect to smoothness and leakage. The ear plugs were delivered in weeks 37 and 38 of 1995.

2.3.3 Test room

The test room had a reverberation time of 1.0 ± 0.2 s. Using multiple loudspeakers, a diffuse sound field was created at the position of the listener that satisfied the requirements of EN 24869-1 (1990).

2.3.4 Threshold measurements

The sound attenuation was determined by measuring subjective hearing thresholds with and without hearing protector for the octave frequencies 125, 250, 500, 1000, 2000, 4000 and 8000 Hz. Order effects and the influence of fatigue were minimized by presenting the frequencies to each subject in random order. Test signals were noise bursts with a bandwidth of $\frac{1}{3}$ octave and a duration of 250 ms. The interval between the noise bursts was also 250 ms. Thresholds were measured with a modified Békésy procedure in which successive presentations were decreased in level by 2 dB as long as the subject indicated, by pressing a button, that the signals were above threshold. The button was to be released when the signal became inaudible, after which the level was increased in steps of 2 dB. When the signal was again above threshold, the button was to be pressed anew and the above procedure repeated itself. The measurement continued until 10 reversals had occurred. The threshold was taken as the dB average of the last six reversals.

Prior to the measurements, the subjects were informed of the test situation and procedures and they were instructed how to insert the ear plugs. They inserted their plugs themselves. To help them check the fit of the ear plugs, a broadband noise with a level of about 70 dB(A) was presented in the test room. Before starting the measurement, the test leader also performed a visual check of the fit. The measurements were conducted in weeks 40-42 of 1995 and weeks 9-10 of 1996.

2.3.5 Results

The sound attenuation was taken as the dB difference between the open- and occluded-ear threshold measurements. Over all 16 subjects, the average values and standard deviations were determined for each frequency. Subsequently, the assumed protection value for 84% of the population (APV_{84}) was obtained by subtracting the standard deviation from the mean. Finally, the single number rating of the attenuation (SNR_{84}) and the estimated attenuations for noise with mainly high, median, or low frequency components (H_{84} , M_{84} and L_{84}) were calculated using the procedure described in ISO 4869-2 (1994). As indicated by their subscripts, these values also apply to 84% of the population.

The minimum attenuations for each test frequency, as specified in EN 352-2 (1993), are given in Table I.

Table I Minimum values for the assumed protection value, as specified in EN 352-2 (1993).

Frequency (Hz)	APV ₈₄
125	5
250	8
500	10
1000	12
2000	12
4000	12
8000	12

The results for the Alpine AOP III custom moulded ear plug, equipped with the filters F2, F4, F6, F7, F8 and F10, are listed and displayed graphically in Appendices A-F. The ear plug in combination with the filters F7, F8 and F10 satisfies the requirements given in Table I.

2.4 Information

(paragraphs 8.1 and 8.2 of EN 352-2)

Wearer information in the Dutch language was supplied by the manufacturer of the ear plugs. Inspection showed that it satisfied the requirements specified in paragraph 8.1 of EN 352-2 (1993).

2.5 Marking

(paragraph 9 of EN 352-2)

It was verified that the ear plugs or their packaging carried the following information:

- a the name, trade mark or other identifying mark of the manufacturer
- b the name of the European standard EN 352-2 (1993)
- c the model designation
- d that the ear plugs are re-usable
- e instructions for fitting and use, which indicate the need for proper fitting.

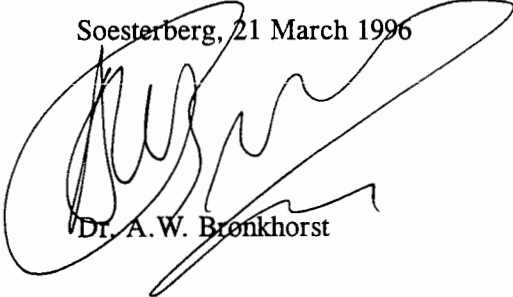
REFERENCES

EN 24869-1 (identical to ISO 4869-1): Acoustics — Hearing protectors — Part 1 (1990). Subjective method for the measurement of sound attenuation. European Committee for Standardization / International Standards Organization.

EN 352-2: Hearing protectors — Safety requirements and testing — Part 2 (1993 E). Ear-plugs. European Committee for Standardization.

ISO 4869-2: Acoustics — Hearing protectors — Part 2 (1994). Estimation of effective A-weighted sound pressure levels when hearing protectors are worn. International Standards Organization.

Soesterberg, 21 March 1996



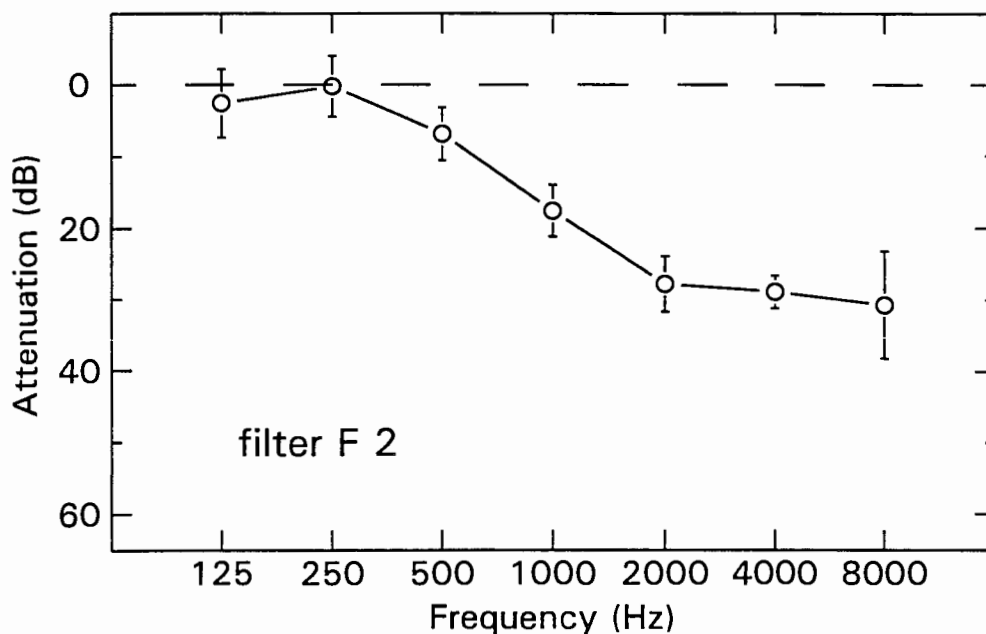
Dr. A.W. Bronkhorst

Appendix A

Alpine AOP III

Filter
F2

Results for 16 subjects obtained in accordance with EN 24869-1 (1990).



Average sound attenuation and standard deviation in dB as a function of test frequency.

Filter F2		125	250	500	1000	2000	4000	8000
	<i>m</i>	2,6	0,2	6,9	17,6	27,8	28,9	30,7
	<i>s</i>	4,8	4,3	3,7	3,6	3,9	2,3	7,5
	APV ₈₄	0,0	0,0	3,2	14,0	23,9	26,6	23,2

Average sound attenuation (*m*), standard deviation (*s*) and APV₈₄, all in dB, for test frequencies in the range 125-8000 Hz.

Filter F2	H ₈₄	M ₈₄	L ₈₄	SNR ₈₄
	20	8	3	12

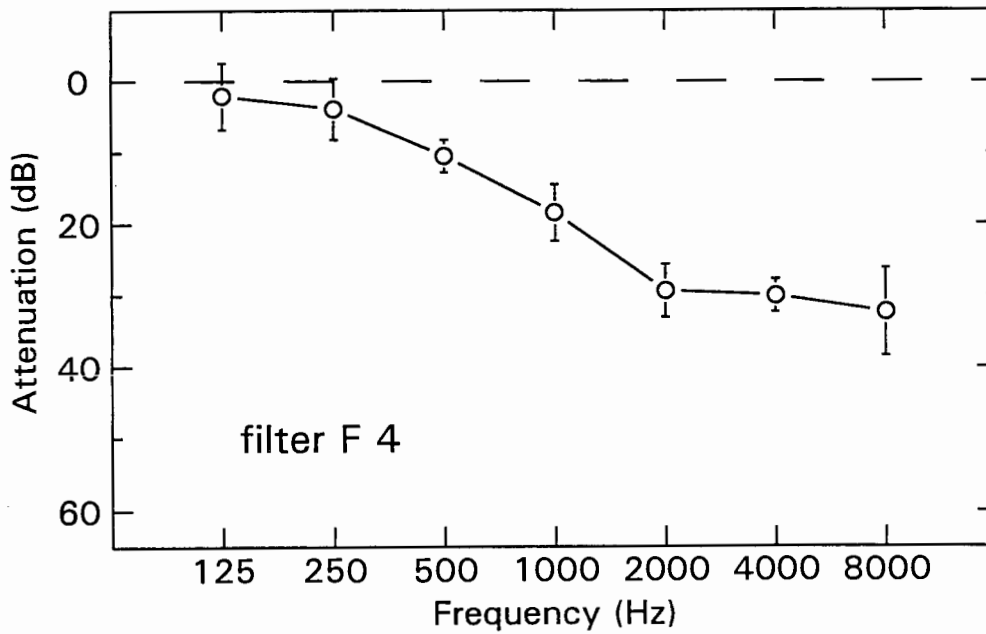
HML-values and SNR-value calculated according to ISO 4869-2 (1994) for $\alpha=1$ (a protection performance of 84%).

Appendix B

Alpine AOP III

Filter
F4

Results for 16 subjects obtained in accordance with EN 24869-1 (1990).



Average sound attenuation and standard deviation in dB as a function of test frequency.

Filter F4		125	250	500	1000	2000	4000	8000
	<i>m</i>	2,1	3,9	10,5	18,5	29,4	30,1	32,4
	<i>s</i>	4,7	4,3	2,3	4,0	3,7	2,3	6,1
	APV ₈₄	0,0	0,0	8,2	14,5	25,7	27,8	26,3

Average sound attenuation (*m*), standard deviation (*s*) and APV₈₄, all in dB, for test frequencies in the range 125-8000 Hz.

Filter F4	H ₈₄	M ₈₄	L ₈₄	SNR ₈₄
		22	11	4

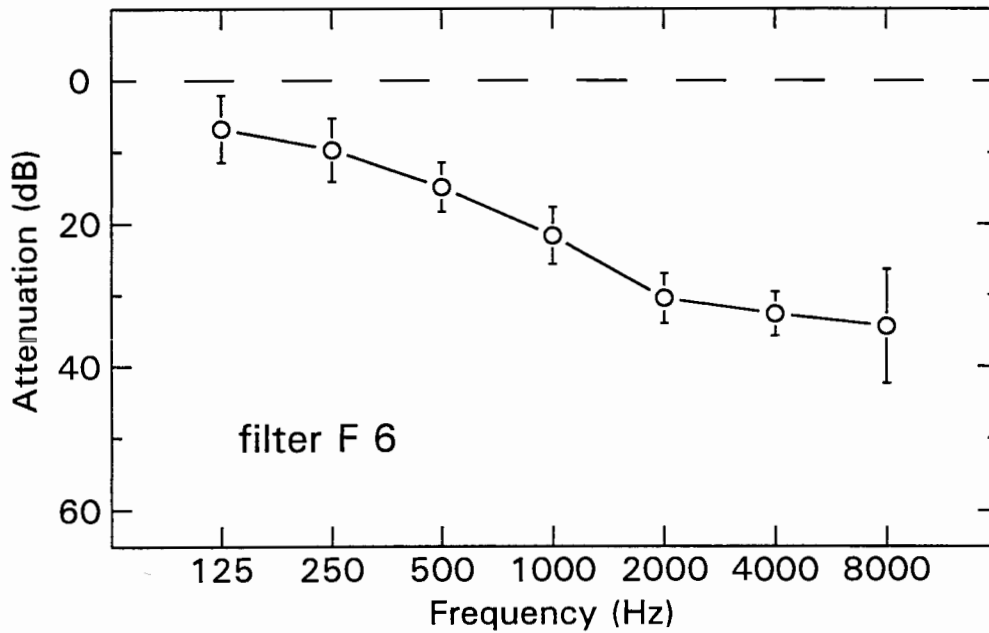
HML-values and SNR-value calculated according to ISO 4869-2 (1994) for $\alpha=1$ (a protection performance of 84%).

Appendix C

Alpine AOP III

Filter
F6

Results for 16 subjects obtained in accordance with EN 24869-1 (1990).



Average sound attenuation and standard deviation in dB as a function of test frequency.

Filter F6		125	250	500	1000	2000	4000	8000
	<i>m</i>	6,8	9,7	14,9	21,7	30,5	32,7	34,4
	<i>s</i>	4,7	4,4	3,4	4,0	3,5	3,1	8,0
	APV ₈₄	2,1	5,3	11,5	17,7	27,0	29,6	26,4

Average sound attenuation (*m*), standard deviation (*s*) and APV₈₄, all in dB, for test frequencies in the range 125-8000 Hz.

Filter F6	H ₈₄	M ₈₄	L ₈₄	SNR ₈₄
	24	15	8	18

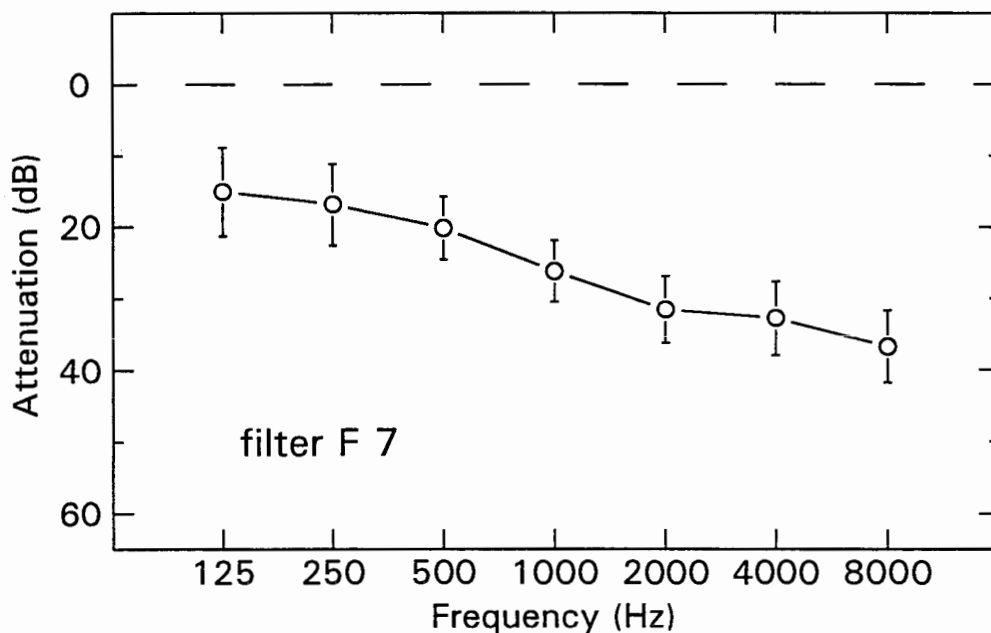
HML-values and SNR-value calculated according to ISO 4869-2 (1994) for $\alpha=1$ (a protection performance of 84%).

Appendix D

Alpine AOP III

Filter
F7

Results for 16 subjects obtained in accordance with EN 24869-1 (1990).



Average sound attenuation and standard deviation in dB as a function of test frequency.

Filter F7		125	250	500	1000	2000	4000	8000
	<i>m</i>	15,1	16,9	20,2	26,2	31,6	32,8	36,8
	<i>s</i>	6,2	5,7	4,4	4,3	4,7	5,2	5,0
	APV ₈₄	8,9	11,2	15,8	21,9	26,9	27,6	31,8

Average sound attenuation (*m*), standard deviation (*s*) and APV₈₄, all in dB, for test frequencies in the range 125-8000 Hz.

Filter F7	H ₈₄	M ₈₄	L ₈₄	SNR ₈₄
	27	19	14	23

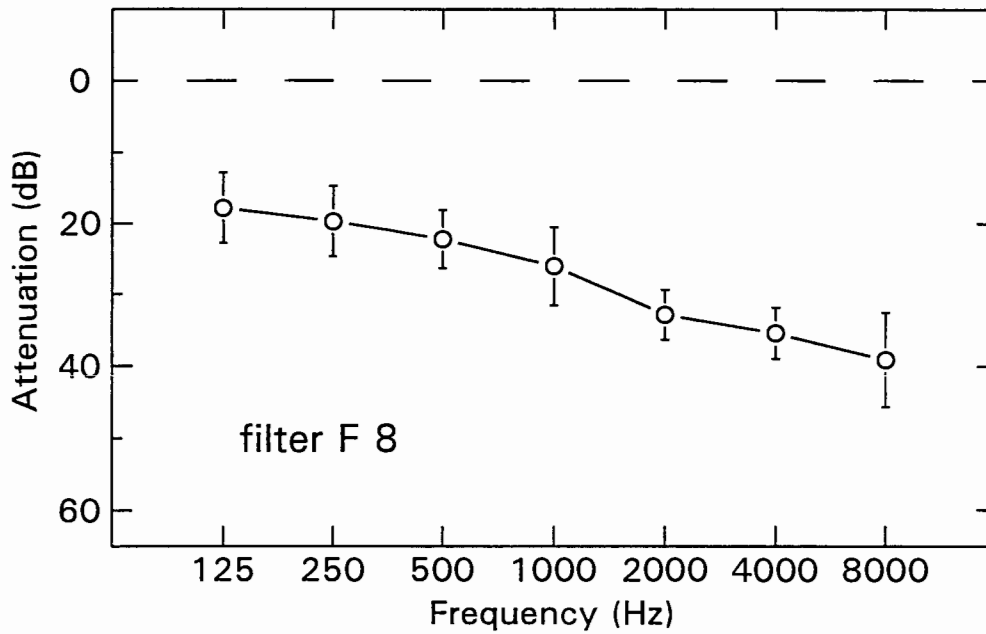
HML-values and SNR-value calculated according to ISO 4869-2 (1994) for $\alpha=1$ (a protection performance of 84%).

Appendix E

Alpine AOP III

Filter
F8

Results for 16 subjects obtained in accordance with EN 24869-1 (1990).



Average sound attenuation and standard deviation in dB as a function of test frequency.

Filter F8		125	250	500	1000	2000	4000	8000
	<i>m</i>	17,8	19,7	22,2	26,0	32,8	35,4	39,1
	<i>s</i>	5,0	5,0	4,1	5,5	3,5	3,6	6,6
	APV ₈₄	12,8	14,7	18,1	20,5	29,3	31,8	32,5

Average sound attenuation (*m*), standard deviation (*s*) and APV₈₄, all in dB, for test frequencies in the range 125-8000 Hz.

Filter F8	H ₈₄	M ₈₄	L ₈₄	SNR ₈₄
		28	21	17

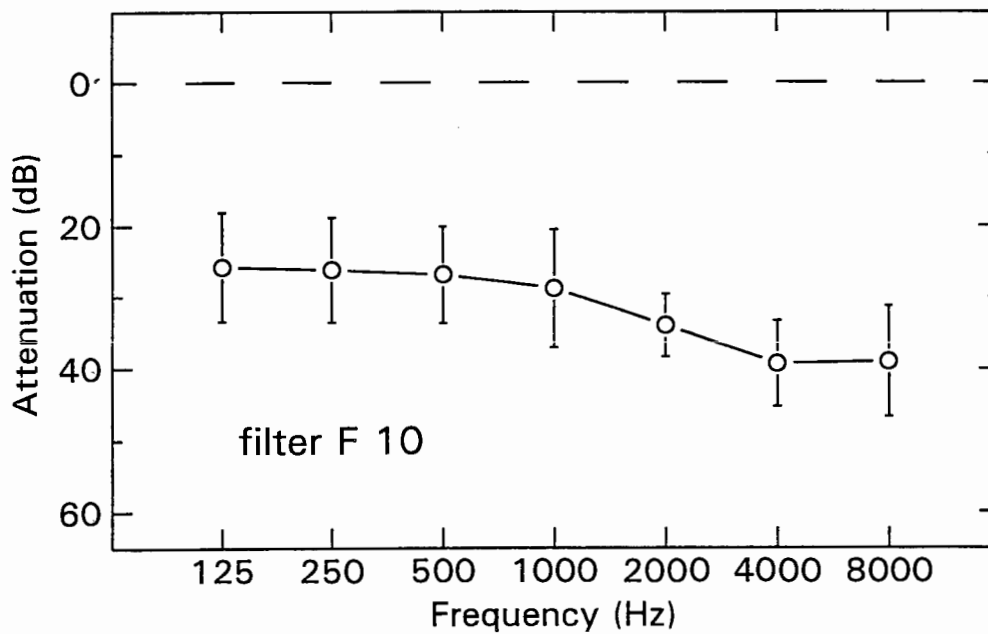
HML-values and SNR-value calculated according to ISO 4869-2 (1994) for $\alpha=1$ (a protection performance of 84%).

Appendix F

Alpine AOP III

Filter
F10

Results for 16 subjects obtained in accordance with EN 24869-1 (1990).



Average sound attenuation and standard deviation in dB as a function of test frequency.

Filter F10		125	250	500	1000	2000	4000	8000
	m	25,8	26,2	26,9	28,8	34,0	39,3	39,0
	s	7,7	7,4	6,8	8,3	4,4	6,0	7,7
	APV_{84}	18,1	18,8	20,1	20,5	29,6	33,3	31,3

Average sound attenuation (m), standard deviation (s) and APV_{84} , all in dB, for test frequencies in the range 125-8000 Hz.

Filter F10	H_{84}	M_{84}	L_{84}	SNR_{84}
	28	22	20	26

HML-values and SNR-value calculated according to ISO 4869-2 (1994) for $\alpha=1$ (a protection performance of 84%).



TNO CERTIFICATION

TNO CERTIFICATION HEREBY

DECLARES THAT THE CERTIFICATION ASSESSMENT

HAS DEMONSTRATED THAT THE PRODUCT

Costom moulded ear plug Alpine AOP III, types: see annex

FROM

Alpine Gehoorbescherming BV at Leusden, the Netherlands

MANUFACTURER'S NAME AND ADDRESS

MANUFACTURER'S REPRESENTATIVE, IF APPLICABLE

HAS BEEN TESTED TO

89/686/EEG PBM and NEN-EN 352-2 (1993)

GUIDELINES OR STANDARDS

BY

TNO Human Factors Research Institute at Soesterberg

TESTING AUTHORITY

AND FULFILLS

THE EUROPEAN REQUIREMENTS

AS DEMONSTRATED BY

see annex

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MANAGING DIRECTOR, TNO CERTIFICATION



CERTIFICATE OF CONFORMITY

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TNO CERTIFICATION
TNO CERTIFICATION

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