ACOUSTICS AND BUILDING PHYSICS
NOISE CONTROL
ENVIRONMENTAL TECHNOLOGY
FIRE SAFETY

PEUTZ

Member ONRI
ISO-9001: 2000 certified

Report

Laboratory for Acoustics

Determination of the sound absorption (reverberation room method) of **different ceiling and wallpanels, type Parmephon®, manufactured by Aktav Acoustics**

Report number A 1597-2E dd. 28 June 2007

Principal:	Aktav Acoustics Reşatbey Mah. Dr. Nusret Fişekçi Cad. Köşk Apt. Kat: I Daire: I ADANA TURKEY
Report number:	A 1597-2E
Date:	11 May 2007 (revised: 28 June 2007)
Ref.:	TS/YW/LvI/A 1597-2E-RA

Peutz bv
Paletsingel 2, Postbus 696
2700 AR **Zoetermeer**
Tel. (079) 347 03 47
Fax (079) 361 49 85
info@zoetermeer.peutz.nl

Peutz bv
Lindenlaan 41, Molenhoek
Postbus 66, 6585 ZH **Mook**
Tel. (024) 357 07 07
Fax (024) 358 51 50
info@mook.peutz.nl

Peutz GmbH
Kolberger Strasse 19
40599 **Düsseldorf**
Tel. +49 211 999 582 60
Fax +49 211 999 582 70
dus@peutz.de

Peutz S.A.R.L.
34 Rue de Paradis
75010 **Paris**
Tel. +33 1 452 305 00
Fax +33 1 452 305 04
peutz@club-internet.fr

Peutz bv
PO Box 32268
London W5 2ZA
Tel. +44 20 88 10 68 77
Fax +44 20 88 10 66 74
peutz.london@tiscali.co.uk

www.peutz.nl

Index

1. INTRODUCTION

At the request of Aktav Acoustics based in Adana (Turkey), laboratory measurements of the sound absorption (reverberation room method) were carried out on

different ceiling and wallpanels, type Parmephon®,
manufactured by Aktav Acoustics

in the Laboratory for Acoustics of Peutz bv, at Mook, The Netherlands (see figure 1).

For this type of measurements the Laboratory for Acoustics has been accredited by the Dutch "Stichting Raad voor Accreditatie" (RvA).
The RvA is member of the EA MLA[1]

Compared with the version published on 11 May 2007, this test report is modified on the following issues:

- textual modifications, wallpanel thickness changed from 20 mm to 40 mm

[1] **EA MLA**: **E**uropean **A**ccreditation Organisation **M**ulti**L**ateral **A**greement: http://www.european-accreditation.org

EA: "*Certificates and reports issued by bodies accredited by MLA and MRA members are considered to have the same degree of credibility, and are accepted in MLA and MRA countries.*"

2. NORMS AND GUIDELINES

The measurements have been carried out according to the Quality Manual of the Laboratory for Acoustics aswell as:

ISO 354:2003 [2)]	Acoustics - Measurement of sound absorption in a reverberation room
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN 354:2003

Various other related norms:

ISO 11654:1997	Acoustics - Sound absorbers for use in buildings - Rating of sound absorption
ASTM-C423-90a	Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

2) *According to this norm, the report should include for each measurement the mean reverberation times T1 end T2 at each frequency. Because these figures are not relevant for judging the quality of the product being tested, but merely for judging the accuracy of the calculations, they have been omitted in this report. It is possible of course to reproduce those figures at any time if the principal requests this.*

3. TESTED CONSTRUCTION

The following specifications were taken from the information supplied by the principal. The density of the materials as reported is derived from the actual weighing by the laboratory staff of the materials under test.

The following ceiling panels have been tested.

type:	**Parmephon® Snow**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	594 x 594 mm
total thickness:	19 mm
finish front:	painted glasstissue
finish back	glass tissue
total mass:	1,9 kg/m^2 (checked by the laboratory)

type:	**Parmephon® Advance**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	594 x 594 mm
total thickness:	19 mm
finish front:	painted glasstissue
finish back	glass tissue
total mass:	1,5 kg/m^2 (checked by the laboratory)

type:	**Parmephon® Polo**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	594 x 594 mm
total thickness:	19 mm
finish front:	painted glasstissue
finish back	glass tissue
total mass:	1,6 kg/m^2 (checked by the laboratory)

The following wall panels have been tested.

type:	**Parmephon® wallpanel 20 mm**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	1200 x 600 mm
total thickness:	20 mm
finish front:	glasstissue + fabric
finish back	glass tissue
finish edges	plastered (see figure 3)
total mass:	2,4 kg/m^2 (checked by the laboratory)

type:	**Parmephon® wallpanel 40 mm**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	1200 x 600 mm
total thickness:	40 mm
finish front:	glasstissue + fabric
finish back	glass tissue
finish edges	plastered with a groove (see figure 3)
total mass:	4,5 kg/m^2 (checked by the laboratory)

The results as presented here relate only to the tested items and laboratory conditions as described in this report. The laboratory can make no judgement about the representativity of the tested samples.

4. MEASUREMENTS

The ceiling panels to be measured (see description in chapter 3) are mounted on a suspension structure at a distance of 200 mm above the floor of the reverberation room. (type E-200 mounting according to ISO 354:2003). The sides of the set-up were enclosed by 18 mm thick plastic covered chipwood board and sealed by tape.

The wall panels to be measured (see description in chapter 3) are mounted in the following measurement set-ups:

1. mounted directly on the floor of the reverberation room. (type A-mounting according to ISO 354:2003, Annex B, Test specimen mountings for sound absorption tests)
2. mounted on a suspension structure with a height of 40 mm. The distance above the floor of the reverberation room was 60 mm for the wall panels with a thickness of 20 mm and 80 mm for the wall panels with a thickness of 40 mm. The sides of the set-up were sealed by tape (see figure 3).

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 354 in the reverberation room of “Peutz bv" in Mook (the Netherlands) (see figure 1). The relevant data regarding the reverberation room are given in figure 2 of this report.

By means of reverberation measurements the reverberation time of the room is measured under two conditions:

- when the reverberation room is empty
- when the construction under test is inside the reverberation room

In general, once material is placed into the reverberation room a lower reverberation time will result.

The difference in reverberation times is a measure of the amount of absorption brought into the room.

Measurements and calculations were carried out in 1/3-octave bandwidth from 100 to 5000 Hz, according to the norms. Where applicable the octave values have been calculated from these 1/3-octave values.

From the reverberation measurements in the empty reverberation room the equivalent sound absorption A_1 is calculated (per frequency band) according to formula 1 and expressed in m^2

$$A_1 = \frac{55{,}3\ V}{c\ T_1} - 4Vm_1 \qquad (1)$$

in which:

V = the volume of the reverberation room in m^3

T_1 = the reverberation time in the empty reverberation room in s

c = the speed of sound in the air, in m/s, calculated according to:

$$c = 331 + 0{,}6\,t \quad [m/s] \tag{2}$$

in which:

t = the temperature in degrees Celsius; this formula is valid for temperatures between 15 and 30 ºC

$$m = \frac{\alpha}{10 \lg (e)} \tag{3}$$

in which :

α = "attenuation coefficient" calculated according to ISO 9613-1

In the same manner the equivalent sound absorption A_2 for the room with the test specimen is calculated according to formula 4, also expressed in m^2

$$A_2 = \frac{55{,}3\,V}{c\,T_2} - 4Vm_2 \tag{4}$$

in which:

c and V have the same definition as in formula 1 and

T_2 = the reverberation time (in s) of the reverberation room with the test specimen placed inside

The equivalent sound absorption A of the test specimen has been calculated according to formula 5 and is expressed in m^2

$$A = A_1 - A_2 \tag{5}$$

When the test specimen consists of one plane with an area between 10 and 12 m^2 the sound absorption coefficient α_S has to be calculated according to formula 6:

$$\alpha_S = \frac{A}{S} \quad [-] \tag{6}$$

in which:

S = the area of the test specimen (in m^2)

4.2. Accuracy

The accuracy of the sound absorption as calculated can be expressed in terms of repeatability (tests within one laboratory) and reproducibility (between various laboratories).

When: - two tests are performed on identical test material - within a short period of time - by the same person or team - using the same instrumentation - under unchanged environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to r.

In order to evaluate the repeatability r for the sound absorption measurements performed in the reverberation room of “Peutz bv" in Mook (the Netherlands) eight series of measurements have been carried out according to ISO 354:1985 annex C. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 200 Hz and at 5000 Hz the repeatability r is 0,21 as a maximum. For the frequency range 250 to 4000 Hz the repeatability r is 0,09 as a maximum.

4.3. Atmospheric conditions

The atmospheric conditions during the measurements are presented in table 1.

Table 1 Atmospheric conditions during the measurements at 9 February 2007

reverberation room	temperature [°C]	atmospheric pressure [kPa]	relative humidity [%]
Empty	16,2	100,5	52,3
Parmephon Snow	16,1	100,4	49,2

4.4. Results

The results of the measurements are given in table 2 and 3 and in figure 4 up to and including 10.

The measurements were made in 1/3-octave bands. The results presented in octave-bands are the arithmetic average of the results of the three 1/3-octave bands belonging to that octave-band.

The values the following one-figure ratings have been calculated and stated :

- the "weighted sound absorption coefficient α_w" according to ISO 11654;

- the "Noise Reduction Coefficient NRC" according to ASTM-C423, being the average of the absorption coefficients (1/3 octave values) at the frequencies of 250, 500, 1000 and 2000 Hz, rounded to the nearest 0,05.

Tabel 2 Measurement results ceiling panels

Ceiling panel type	sound absorption coefficient α_s					
	Snow		Advance		Polo	
Figure	4		5		6	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	0,22		0,24		0,20	
125	0,39	0,41	0,35	0,39	0,35	0,37
160	0,62		0,59		0,55	
200	0,64		0,63		0,61	
250	0,84	0,80	0,81	0,79	0,79	0,77
315	0,91		0,92		0,92	
400	0,89		0,90		0,89	
500	0,90	0,89	0,95	0,91	0,94	0,91
630	0,88		0,89		0,89	
800	0,80		0,84		0,83	
1000	0,83	0,86	0,80	0,85	0,78	0,84
1250	0,95		0,91		0,91	
1600	0,93		0,94		0,94	
2000	0,96	0,96	0,94	0,96	0,94	0,95
2500	1,00		0,99		0,98	
3150	1,02		0,99		0,97	
4000	1,00	0,99	0,99	1,00	0,99	0,99
5000	0,95		1,01		1,01	
α_w	0,90		0,90		0,90	
NRC	0,90		0,90		0,85	

Table 3 Measurement results wall panels

	sound absorption coefficient α_s							
Thickness wall panel	20 mm		20 mm		40 mm		40 mm	
Total height	20 mm		60 mm		40 mm		80 mm	
Figure	7		8		9		10	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	0,04		0,09		0,10		0,16	
125	0,05	0,05	0,10	0,13	0,18	0,21	0,31	0,32
160	0,07		0,19		0,35		0,48	
200	0,12		0,27		0,47		0,61	
250	0,20	0,22	0,43	0,45	0,67	0,65	0,79	0,75
315	0,35		0,64		0,81		0,84	
400	0,49		0,83		0,91		0,90	
500	0,66	0,64	0,96	0,93	0,95	0,95	0,97	0,94
630	0,77		1,01		0,98		0,96	
800	0,84		1,01		1,00		0,98	
1000	0,94	0,92	1,01	1,01	0,97	0,99	0,99	0,98
1250	0,97		1,02		1,00		0,97	
1600	1,03		1,02		1,00		1,01	
2000	1,05	1,04	1,00	1,00	1,01	1,01	1,02	1,01
2500	1,04		0,99		1,02		1,01	
3150	1,01		1,01		1,03		1,04	
4000	1,02	1,02	1,02	1,03	1,03	1,02	1,03	1,04
5000	1,02		1,06		1,01		1,04	
α_w	0,50(MH)		0,75(MH)		0,95		1,00	
NRC	0,70		0,85		0,90		0,95	

The sound absorption coefficient of a material is not a material property. Is should be taken into account that the sound absorption of a construction depends on the dimensions, the way of mounting of the material and its position in the room.

Mook,

Th. Scheers
Laboratory Supervisor

ir. M.L.S Vercammen
Manager

This report contains:

11 pages

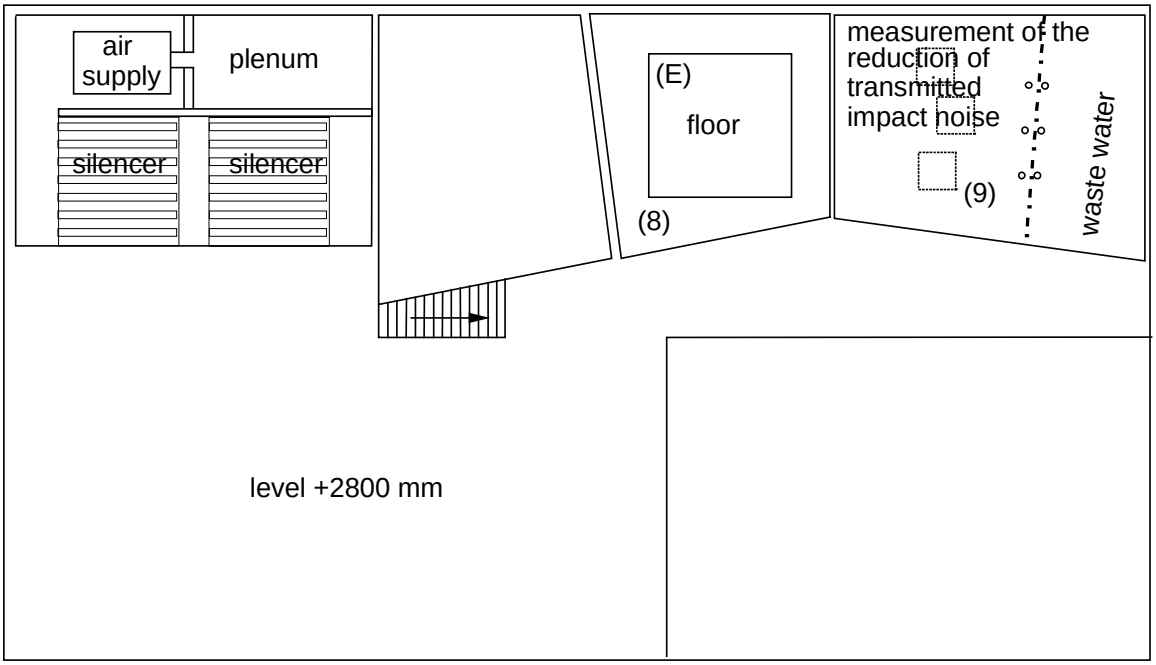
10 figures

LABORATORY FOR ACOUSTICS

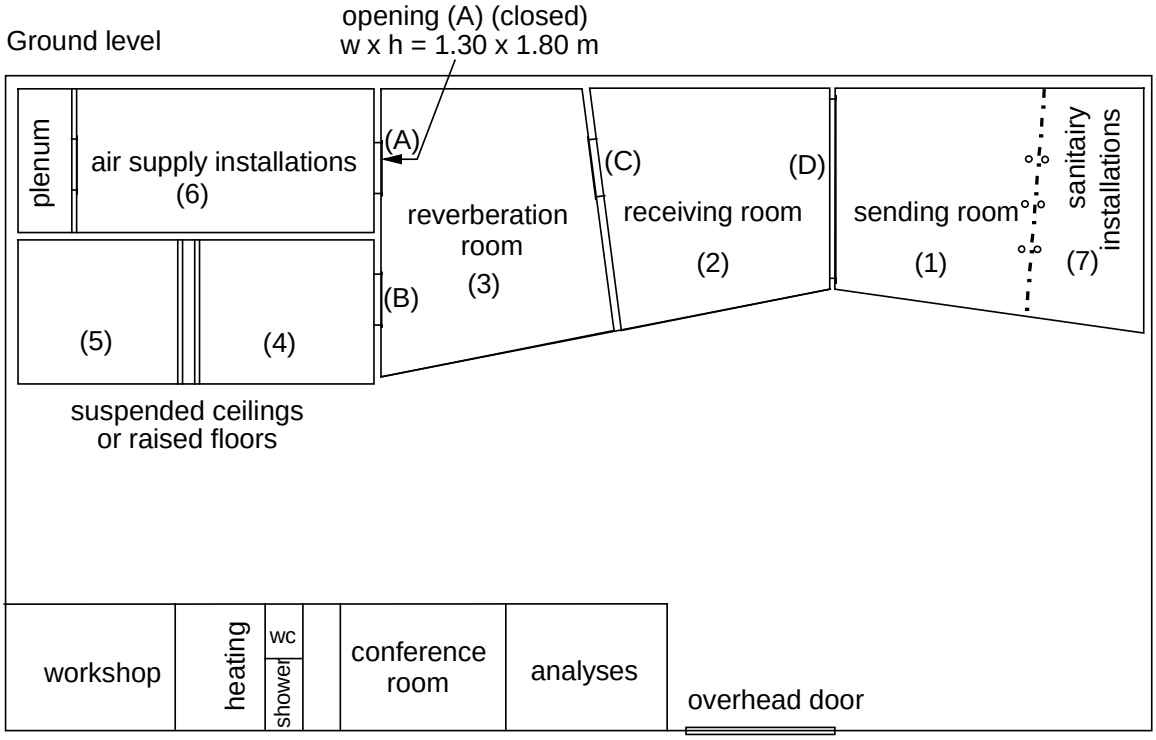
PEUTZ bv
Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), THE NETHERLANDS

OVERVIEW

Story



Ground level



TEST OPENINGS (w x h in mm)
(B) 1000 x 2200
(C) 1500 x 1250
(D) 4300 x 2800
(E) 4000 x 4000

0 1 2 3 4 5 m
scale

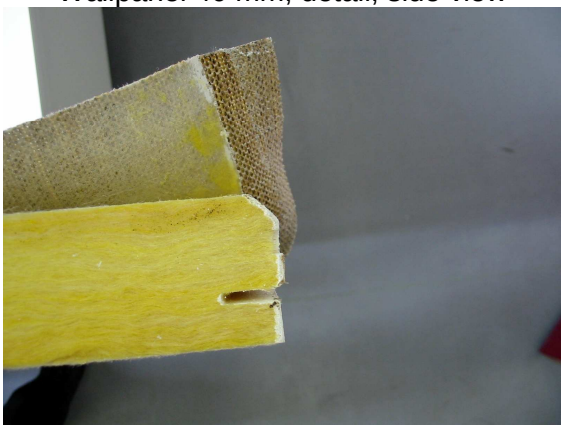
WALLPANELS

Wallpanel, thickness 20 mm, under test

Wallpanel, thickness 40 mm, under test

Wallpanel 20 mm, detail, side view

Wallpanel 40 mm, detail, side view



Wallpanel 20 mm, detail, top view

Wallpanel 40 mm, detail, top view

PEUTZ bv
Lindenlaan 41, 6584 AC MOLENHOEK (LB), HOLLAND

REVERBERATION ROOM

The reverberation room meets the requirements of ISO 354:2003.

additional data:
volume : 214 m^3
total area S_t (walls, floor and ceiling) : 219 m^2

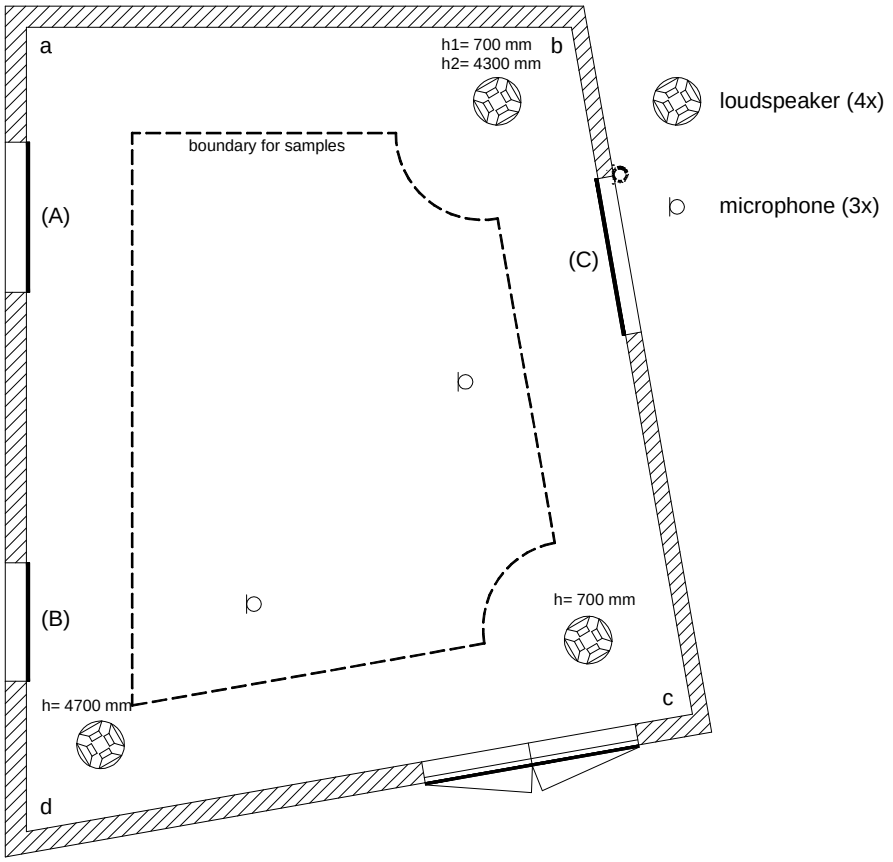
diffusion: by the shape of the room and by adding 6 curved and 2 flat reflecting elements with a total area of approx. 13 m^2 a sufficient diffusion has been gained.

reverberation time of the empty reverberation room during measurements of 09-02-2007

frequency (1/1 oct.)	125	250	500	1000	2000	4000	Hz
reverberation time	9,87	7,90	8,31	6,89	4,69	2,87	s

repeatability r c.f. ISO 354:1985 annex C (see chapter 4.2 of this report).

r at high α	0.13	0.08	0.06	0.03	0.05	0.09	-
r at low α	0.11	0.02	0.01	0.02	0.02	0.05	-



(closed) testopenings
(width x height in mm)
(A): 1300 x 1800
(B): 1000 x 2200
(C): 1500 x 1250

height at:
a: 5573 mm
b: 5102 mm
c: 5000 mm
d: 5580 mm

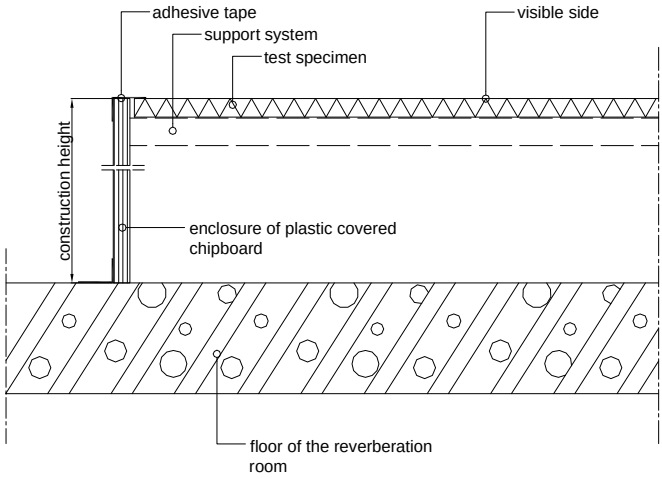
0 1 2 m

Absorb versie 4.3.1, mode 7 file: a1597 E#:759-794 T_1 = 16,2 °C p_1 = 100,5 kPa h_1 = 52,3 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® Snow**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	594 x 594 mm
total thickness:	19 mm
finish front:	painted glasstissue
finish back	glass tissue
total mass:	1,9 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,200 m

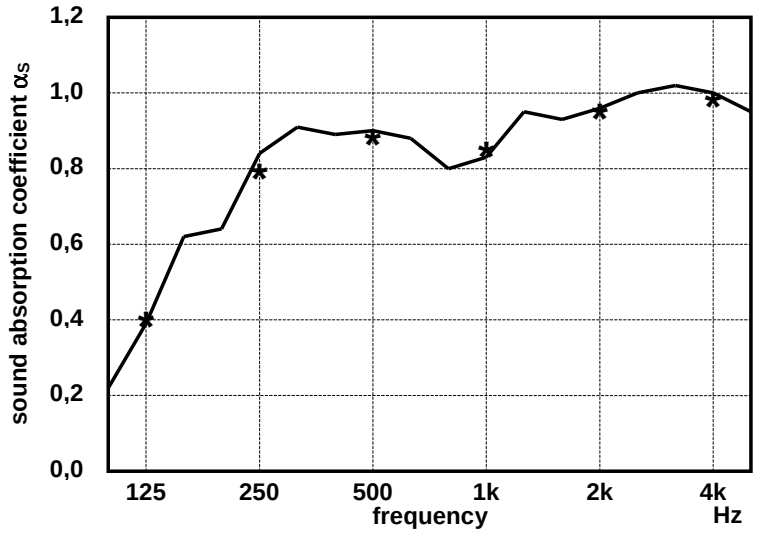
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 0,90

NRC (ASTM - C423) = 0,90



	125	250	500	1k	2k	4k
	0,22	0,64	0,89	0,80	0,93	1,02
1/3 oct.	0,39	0,84	0,90	0,83	0,96	1,00
	0,62	0,91	0,88	0,95	1,00	0,95
1/1 oct.	**0,41**	**0,80**	**0,89**	**0,86**	**0,96**	**0,99**

——— 1/3 oct.

* 1/1 oct.

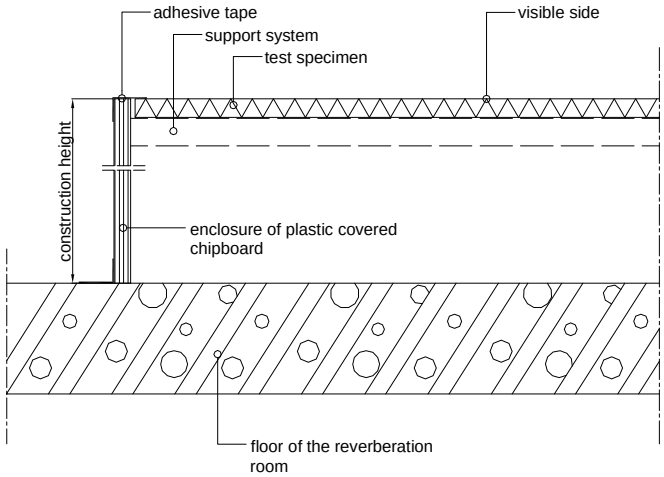
Mook, 09-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:759-794 F#:650-685 A#:795 T_1 = 16,2 °C T_2 = 16,1 °C p_1 = 100,5 kPa p_2 = 100,4 kPa h_1 = 52,3 % h_2 = 49,2 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® Advance**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	594 x 594 mm
total thickness:	19 mm
finish front:	painted glasstissue
finish back	glass tissue
total mass:	1,5 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,200 m

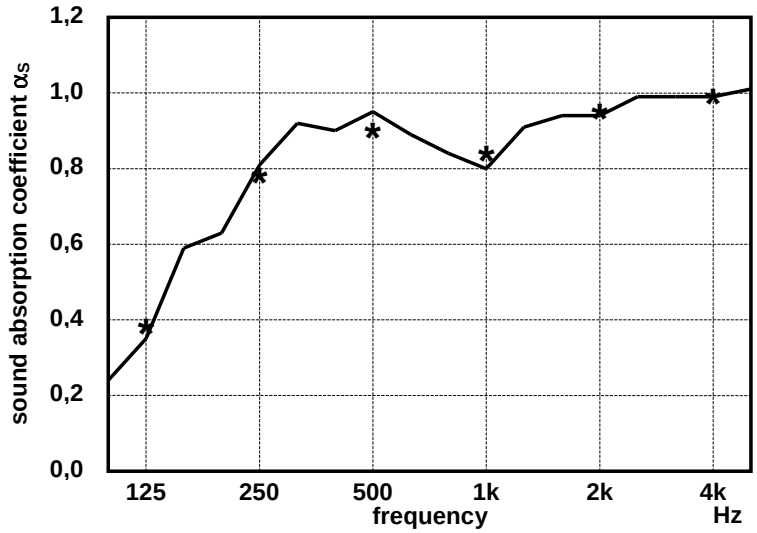
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 0,90

NRC (ASTM - C423) = 0,90



	125	250	500	1k	2k	4k
	0,24	0,63	0,90	0,84	0,94	0,99
1/3 oct.	0,35	0,81	0,95	0,80	0,94	0,99
	0,59	0,92	0,89	0,91	0,99	1,01
1/1 oct.	**0,39**	**0,79**	**0,91**	**0,85**	**0,96**	**1,00**

——— 1/3 oct.
* 1/1 oct.

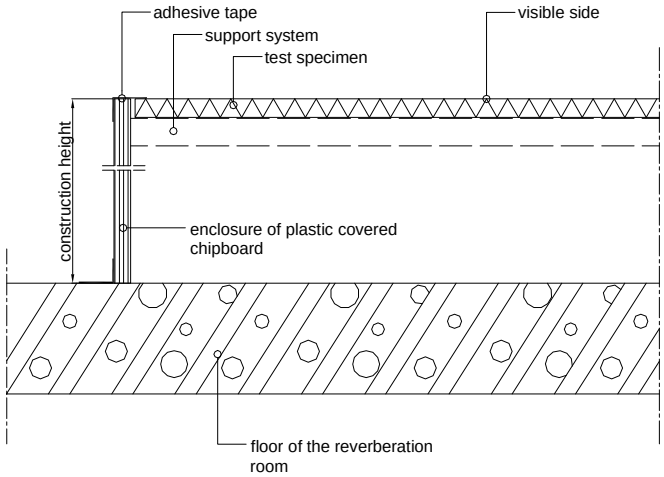
Mook, 09-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:759-794 F#:687-722 A#:796 T_1 = 16,2 °C T_2 = 16,3 °C p_1 = 100,5 kPa p_2 = 100,4 kPa h_1 = 52,3 % h_2 = 50,8 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® Polo**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	594 x 594 mm
total thickness:	19 mm
finish front:	painted glasstissue
finish back	glass tissue
total mass:	1,6 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,200 m

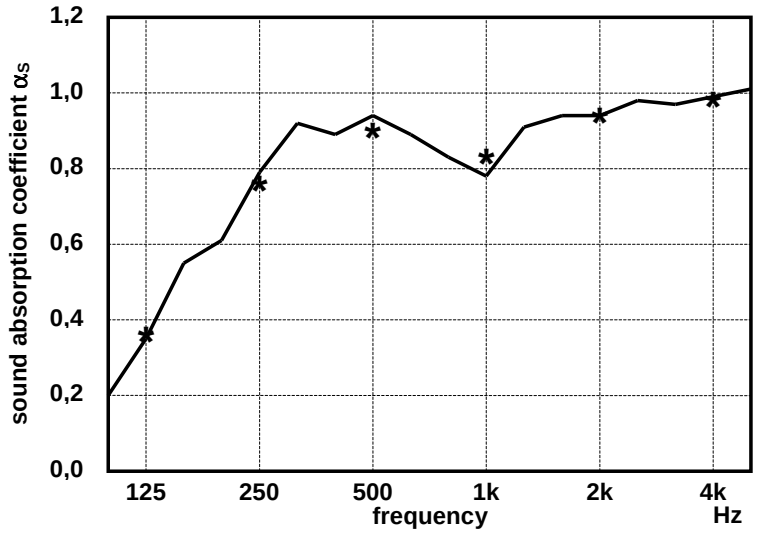
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 0,90

NRC (ASTM - C423) = 0,85



	0,20	0,61	0,89	0,83	0,94	0,97
1/3 oct.	0,35	0,79	0,94	0,78	0,94	0,99
	0,55	0,92	0,89	0,91	0,98	1,01
1/1 oct.	**0,37**	**0,77**	**0,91**	**0,84**	**0,95**	**0,99**

——— 1/3 oct.

* 1/1 oct.

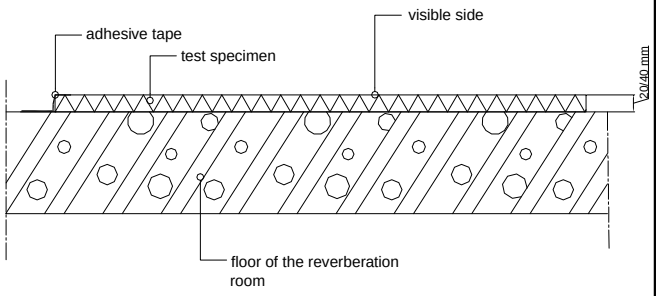
Mook, 09-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:759-794 F#:723-758 A#:797 T_1 = 16,2 °C T_2 = 16,2 °C p_1 = 100,5 kPa p_2 = 100,5 kPa h_1 = 52,3 % h_2 = 52,1 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® wallpanel 20 mm**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	1200 x 600 mm
total thickness:	20 mm
finish front:	glasstissue + fabric
finish back	glass tissue
finish edges	plastered
total mass:	2,4 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,020 m

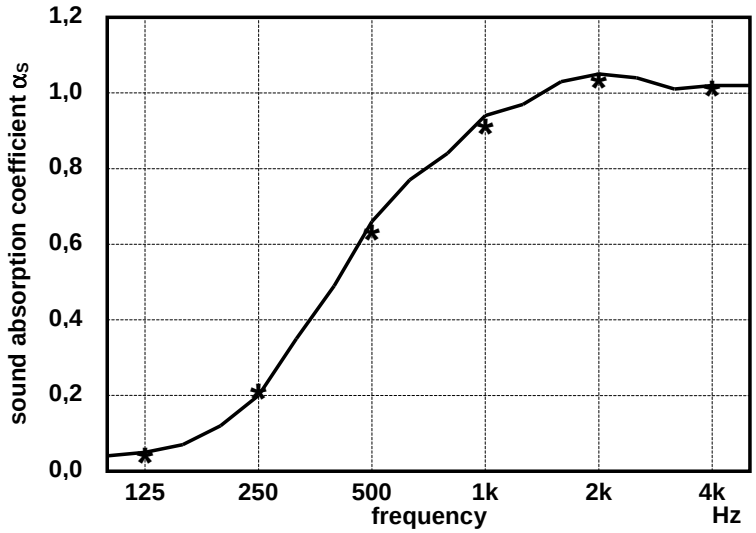
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 0,50(MH)

NRC (ASTM - C423) = 0,70



	125	250	500	1k	2k	4k
	0,04	0,12	0,49	0,84	1,03	1,01
1/3 oct.	0,05	0,20	0,66	0,94	1,05	1,02
	0,07	0,35	0,77	0,97	1,04	1,02
1/1 oct.	**0,05**	**0,22**	**0,64**	**0,92**	**1,04**	**1,02**

——— 1/3 oct.

* 1/1 oct.

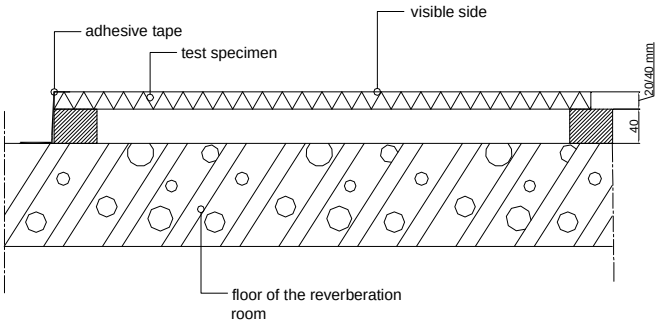
Mook, 15-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:800-835 F#:984-1019 A#:1020 T_1 = 16,2 °C T_2 = 16,0 °C p_1 = 102,3 kPa p_2 = 102,2 kPa h_1 = 50,1 % h_2 = 49,0 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® wallpanel 20 mm**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	1200 x 600 mm
total thickness:	20 mm
finish front:	glasstissue + fabric
finish back	glass tissue
finish edges	plastered
total mass:	2,4 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,060 m

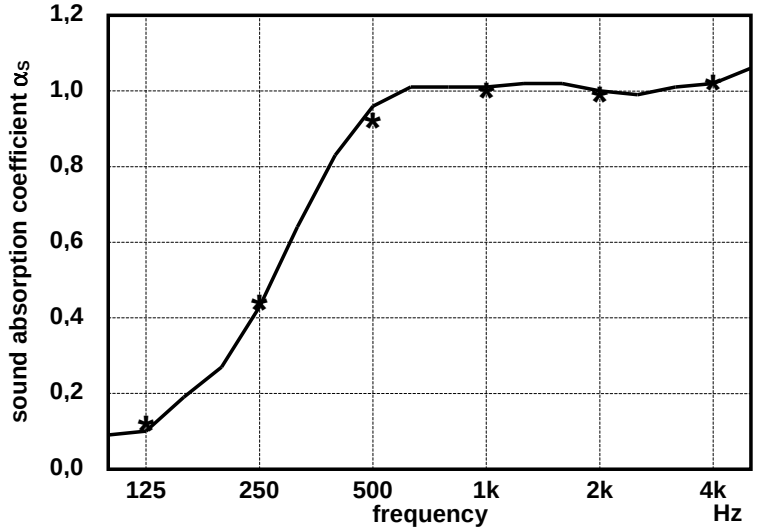
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 0,75(MH)

NRC (ASTM - C423) = 0,85



	125	250	500	1k	2k	4k
	0,09	0,27	0,83	1,01	1,02	1,01
1/3 oct.	0,10	0,43	0,96	1,01	1,00	1,02
	0,19	0,64	1,01	1,02	0,99	1,06
1/1 oct.	**0,13**	**0,45**	**0,93**	**1,01**	**1,00**	**1,03**

——— 1/3 oct.
* 1/1 oct.

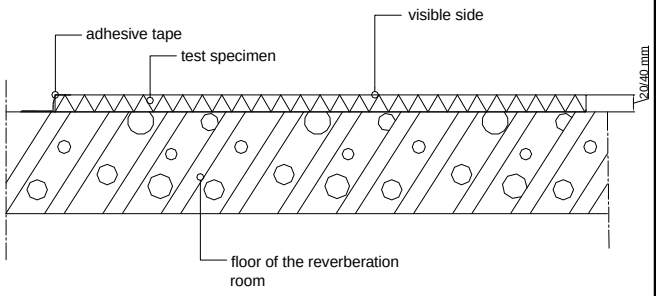
Mook, 15-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:800-835 F#:947-982 A#:983 T_1 = 16,2 °C T_2 = 16,1 °C p_1 = 102,3 kPa p_2 = 102,2 kPa h_1 = 50,1 % h_2 = 48,6 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® wallpanel 40 mm**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	1200 x 600 mm
total thickness:	40 mm
finish front:	glasstissue + fabric
finish back	glass tissue
finish edges	plastered with a groove
total mass:	6,5 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,040 m

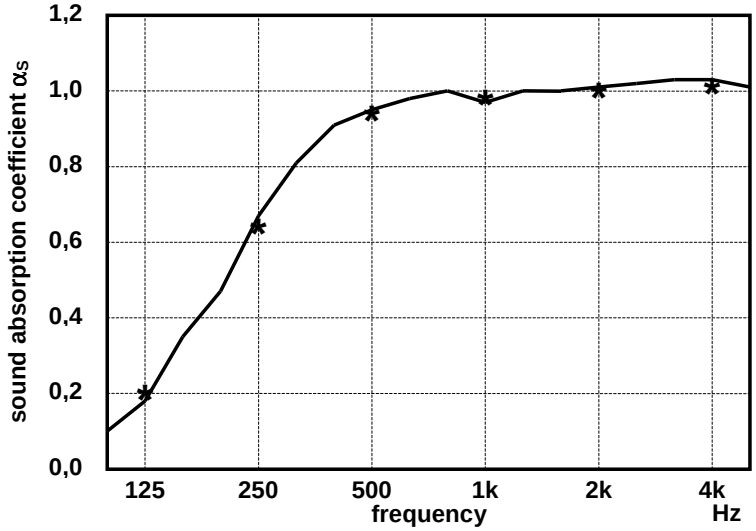
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 0,95

NRC (ASTM - C423) = 0,90



	125	250	500	1k	2k	4k
	0,10	0,47	0,91	1,00	1,00	1,03
1/3 oct.	0,18	0,67	0,95	0,97	1,01	1,03
	0,35	0,81	0,98	1,00	1,02	1,01
1/1 oct.	**0,21**	**0,65**	**0,95**	**0,99**	**1,01**	**1,02**

——— 1/3 oct.
* 1/1 oct.

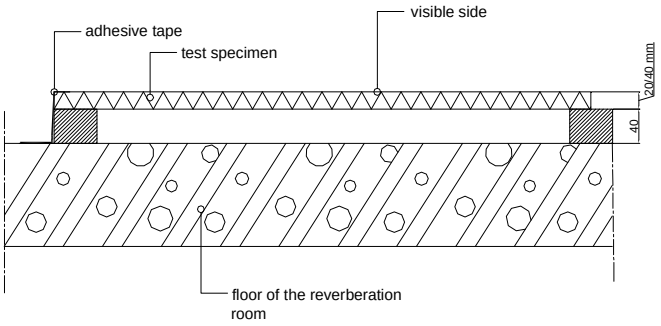
Mook, 15-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:800-835 F#:910-945 A#:946 T_1 = 16,2 °C T_2 = 15,9 °C p_1 = 102,3 kPa p_2 = 102,2 kPa h_1 = 50,1 % h_2 = 52,4 %

MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003
principal: Aktav Acoustics

TESTING RvA L 334

type:	**Parmephon® wallpanel 40 mm**
manufacturer:	Aktav Acoustics
material:	glasswool
panel sizes:	1200 x 600 mm
total thickness:	40 mm
finish front:	glasstissue + fabric
finish back	glass tissue
finish edges	plastered with a groove
total mass:	6,5 kg/m^2



volume reverberation room: 214 m^3

surface area sample: 10,8 m^2

heigth of the construction: 0,080 m

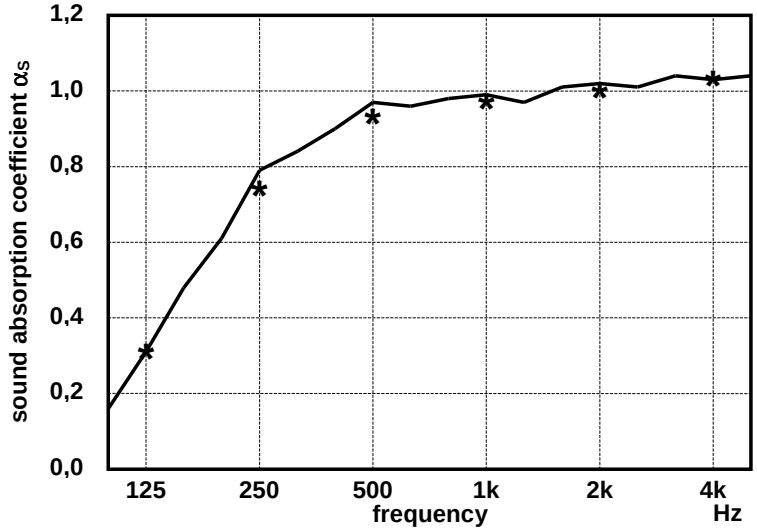
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

α_w (ISO 11654) = 1,00

NRC (ASTM - C423) = 0,95



	125	250	500	1k	2k	4k
	0,16	0,61	0,90	0,98	1,01	1,04
1/3 oct.	0,31	0,79	0,97	0,99	1,02	1,03
	0,48	0,84	0,96	0,97	1,01	1,04
1/1 oct.	**0,32**	**0,75**	**0,94**	**0,98**	**1,01**	**1,04**

——— 1/3 oct.

* 1/1 oct.

publication is permitted for the entire page only

Mook, 15-02-2007

Absorb versie 4.3.1, mode 7 file: a1597 E#:800-835 F#:873-908 A#:909 T_1 = 16,2 °C T_2 = 15,9 °C p_1 = 102,3 kPa p_2 = 102,3 kPa h_1 = 50,1 % h_2 = 53,0 %