

Report

Member ONRI ISO-9001 certified

Laboratory for Acoustics Determiation of the sound insulatition of several variants of a relocatable system partion type IS made by Maars Production BV

Report number A 691-1E dd. 11 September 2002

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neers), RVOI-1998. KvK: 12028033. BTW: NL004933837B01.

Principal: Maars Produktie BV PO Box 1000 NL-3840 BA Harderwijk

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1. INTRODUCTION

At the request of Maars Produktie BV at Harderwijk (Netherlands) sound insulation measurements have been carried out on

various variants of a relocatable system partition made by Maars Produktie BV (Netherlands)

in the Laboratory for Acoustics of "Adviesbureau Peutz & Associés B.V.", Mook, The Netherlands (see figure 1).

Remarks on the occasion of the translation in 2002:

The measurements took place in 1997 and have been reported in the Dutch report A691-1 dated 9 october 1997.

The laboratory in which the measurements took place has been in use since January 1, 1996.

Regarding this laboratory it has been proved to be in accordance with ISO 140-1:1997 (this was part of the accreditation as a test laboratory *ac*-cording to EN45001, later: EN ISO/IEC 17025). The laboratory and the Quality System of it complied to the accreditation criteria and as a result it was *ac*-credited so in feb 2000.

Where applicable the single value ratings R_W according to ISO 717-1 have been determined in 2002 according to the 1999 edition of that norm



2. NORMS AND GUIDELINES

The measurements have been carried out according to:

ISO 140-3:1995Acoustics - Measurements of sound insulation in buildings and of building elements: Part 3: Laboratory measurements of airborne sound insulation of building elementsNOTE:this international standard has been accepted within all EU-countries as
European Norm EN ISO 140-3:1995

Various other related norms:

ISO 140-1:1997	Acoustics - Measurement of sound insulation of building elements - Part 1: Requirements for laboratory test facilities with suppressed flanking transmission
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN ISO 140-1:1997
ISO 140-2:1991	Acoustics - Measurement of sound insulation of building elements - Part 2: Determination, verification and application of precision data
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN 20140-2:1993
ISO 717-1:1996	Acoustics - Rating of sound insulation in buildings and of building ele- ments - Part 1: Airborne sound insulation
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN ISO 717-1:1996



3. TESTED CONSTRUCTIONS

The construction to be tested has been placed by the principal between two test rooms. The description of the specimen and the construction used are copied from the data e-ceived from the principal.

This partition (dimension w x h x t 4300 x 2800 x 100 mm) exists of a framework on both sides of which wallpanels were fixed .

The framework itself comprises galvanised steel components such as floor- and overheadprofiles, two wall connection profiles and several vertical C-studs.

Within the W-shaped floor- and overhead-profiles of 1mm thick there are two stripes of 9.5mm thick gypsumboard.

The vertical wall connection profiles are composed of two separate U-shaped steel profiles in which the wall panels were shifted.

The vertical C-studs were made of 1.5mm thick, perforated steel

On the back of the perimeter profiles self-adhesive PVC foam tape (6 x 9mm semi-closed cells) has been fixed

The wall-panels exist of an outer plating of 0.9mm steel onto which a 12.5mm thick plasterboard has been glued. The gypsum side of the panels is covered with 20mm thick Rockwool type 211. The panels were fixed to the framework using screwed U-shaped profiles.

The following test variants were carried out:

- A. the basic structure as described above, panel width 1200mm, see figure 2
- B. the basic structure as described above, panel width 900mm, but no rockwool in the wall cavity nor in the bottom- and overhead profiles, see figure 3
- C. the basic structure as described above, panel width 900mm, see figure 4
- D. like C, but one side of the wall panels with 15mm thick plasterboard instead of 12.5mm, see figure 5



4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-3 in the Laboratory for Acoustics of Adviesbureau Peutz & Associés BV in Mook. A detailed description of the test set up has been given in the figure 6 of this report.

The construction to be tested is placed into a test opening between two measuring rooms. In one of the rooms (the so-called sending room) broad-band noise is generated by loudspeakers.

In this sending room as well as in the adjacent room (the "receiving room") the resulting sound pressure level is measured by means of a continuous rotating boom, so the (timeand space-) averaged sound pressure level is determined.

The reverberation time of the receiving room is also measured.

The instruments and the method used meet the requirements of ISO 140-3

As allowed by the test method the test procedure is repeated reversing the sending and receiving rooms. The reported value of each sound insulation is the arithmetic average of the two results.

In ISO 140-3 the airborne sound insulation of an object is defined as the "sound reduction index R" to be evaluated according to formula 1 and expressed in dB:

$$R = L_1 - L_2 + 10 \log\left(\frac{S}{A}\right)$$
(1)

in which:

- L_1 = sound pressure level in the sending room [dB]
- L_2 = sound pressure level in the receiving room [dB] [m²]
- S = area of the object to be tested
- equivalent sound absorption $[m^2]$ in the receiving room according to: A =

$$A = \frac{0.16 \cdot V}{T}$$
(2)

in which :

V	=	volume of the receiving room	[m ³]
Т	=	reverberation time in the receiving room	[s]



4.2. Accuracy

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

4.2.1. Repeatability r

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 insulation measurements performed in the laboratories of "Adviesbureau Peutz & Associés" in Mook eight series of measurements have been carried out according to ISO 140-2. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 250 Hz the repeatability r is 2.0 dB as a maximum. For the frequency range 315 to 3150 Hz the repeatability r is 1.3 dB as a maximum.

The repeatability r regarding the single-figure rating R_w is 0.7 dB as a maximum. As ISO 717-1 prescribes rounding of the R_w -values to the nearest dB repeatability r of 1 dB is applicable for the R_w -value.

From these results it may be concluded that the repeatability r as found satisfies the demands of ISO 140-2.

4.2.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories - by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

In ISO 140-2 there is a statement on the reproducibility R to be expected, based on the results of various inter-laboratory tests. The reproducibility of the single figure rating R_w is about 3 dB.



4.3. Results

The results of the measurements are given in table I and in figures 8 to 11

Table I: results of the measurements

	SOUND REDUCTION INDEX R [dB]							
Variant		A		3	С		D	
panel width [mm]	1200		900		900		900	
rockwool in cavity	ye	es	n	0	yes		yes	
gypsum board	2 x 12	2 x 12.5mm		2.5mm	2 x 12.5mm		1x15 n	nm and
							1x12	.5mm
figure	-	7		8	Ç	9	1	0
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	22.1		22.9		22.0		24.4	
125	28.6	25.7	23.3	22.5	29.5	25.9	30.3	27.9
160	32.5		21.4		34.7		35.0	
					40 5		40.0	
200	39.5	40.0	23.0	05.0	40.5	40.7	43.0	45.0
250	44.5	42.6	26.9	25.8	43.6	42.7	46.1	45.2
315	47.9		31.0		45.6		47.9	
400	40.2		24 5		19.6		10.2	
400	49.Z	10.9	34.0	26.7	40.0	40 E	49.3 51.5	50.7
500	49.7 50.7	49.0	37.3	30.7	49.3	49.0	51.0	50.7
030	50.7		40.5		51.0		51.0	
800	50.6		12 9		517		51.8	
1000	50.5	50.5	44.3	43.9	51.4	51.8	51.0	51.1
1250	50.5	00.0	44.7	10.0	52.3	0110	50.5	0
	0010				02.0		0010	
1600	48.3		41.5		50.0		48.5	
2000	43.1	44.1	39.2	40.7	45.3	46.8	47.0	47.7
2500	42.8		41.8	-	46.4		47.8	
3150	47.8		46.2		49.8		51.3	
4000	50.3	48.7	47.8	47.0	54.3	52.8	56.7	54.6
5000	48.3		47.1		58.1		60.6	
R _w (C;C _{tr})	46(-2;-6) dB		39(-2	;-6) dB	48(-2;	-8) dB	49(-2	-7) dB

In the tables and graphs the values of the insulation found are presented in 1/3 octave bands.

From these values the weighted sound reduction index $R_{\rm w}$ according to ISO 717-1 including the spectrum adaptation terms C and $C_{\rm tr}$ have been calculated and stated.

Th. Scheers Leader of the Laboratory Mook, ir. M.L.S Vercammen manager

This report contains: 8 page(s) and 11 figures



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report nr. A 691-1E

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ref. curve (ISO 717)

1/3 oct.

Mook, 30-01-1997

44.1

48.7 dB

MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: varaint B Section A-A Section B-B 66) (05) 01 15 (14) Detail C 08 (01) Ceiling & Flaar track 75x63x0.8mm (Q2) Foamtape 3x9mm (03) Adjusting screw with plug 510 a < 500mm (04) Wall track 103x25x0.9mm dB G (05) Wall panel 60 (%) (06) Plasterboard 12.5mm (08) Stud 60x30x1mm (09) Foamtape 2x30mm (08) 50 (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm (13) U-profile &3x50x0.9mm 40 0Z (15) Plasterboard 9.5mm ≌ (03) sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 39(-2;-6) dB$ 0 125 250 500 1k 2k 4k frequency Hz 42.9 22.9 23.0 34.5 46.2 41.5 1/3 oct. 23.3 44.3 39.2 47.8 dB 26.9 37.3 21.4 31.0 40.3 44.7 41.8 47.1 1/1 oct. 1/3 oct. 47.0 dB 1/1 oct. 22.5 25.8 36.7 43.9 40.7 ref. curve (ISO 717) publication is permitted for the entire page only

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MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant C Section A-A Section B-B (06) (13) 608 (05) 02 {04 03 ØŹ WWW WWW WWWW (01) 15 (74) Detail ((01) Ceiling & Floor track 15x63x0.8mm (02) Foamtape 3x9nm (03) Adjusting screw with plug \$10 a < 500mm (04) Wall track 103x25x0.9mm (05) Wall panel dB (E) 60 (06) Plasterboard 12.5mm (86) (07) Rockwool pad 20mm (17) (08) Stud 60x30x1mm (09) Foamtape 2x30mm (88) 50 (10) U-profile 10x8x1.5mm (11) Serew 3.5x22mm (12) PVE Infill strip 10x8x1mm (13) U-profile 63x50x0.9mm m (14) Rockwool pad 40mm 40 ≌ 0Ì sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 48(-2;-8) dB$ 0 125 250 500 1k 2k 4k frequency Hz 22.0 40.5 48.6 51.7 50.0 49.8 1/3 oct. 29.5 49.3 45.3 54.3 dB 43.6 51.4 34.7 45.6 51.0 52.3 46.4 58.1 1/1 oct. 1/3 oct. 1/1 oct. 25.9 42.7 49.5 51.8 46.8 52.8 dB ref. curve (ISO 717)

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Mook, 05-03-1997

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MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant D Section B-B Section A-A 663 (oż 25 03 www WWWW www (02) (1) NWWW WWWW WWWW WWW MMM TS) (14) 660 Detail C (*05*) (01) Ceiling & Floor track 75x63x0.8mm (02) Foamtape 3x9mm 66) (03) Adjusting screw with plug 510 a < 500mm (066) (04) Wall track 103x25x0.9mm (05) Wall panel dB 80 (6) Plasterboard 12.5mm (66) Plasterboard 15mm (07) (07) Rockwool pad 20mm (DB) Stud 60x30x1mm (08) 70 (19) Foamtape 2x30mm (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm 1 (13) U-profile 63x50x0.9mm 60 02) ≌ (14) Rockwool pad 40mm Ø3 sound reduction index 50 volume sending room: 94 m³ volume receiving room: 111 m³ 40 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 30 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 49(-2;-7) dB$ 20 125 250 500 1k 2k 4k frequency Hz 24.4 43.0 49.3 51.8 48.5 51.3 1/3 oct. 30.3 51.5 51.0 56.7 dB 46.1 47.0 35.0 47.9 51.8 50.5 47.8 60.6 1/1 oct. 1/3 oct. 1/1 oct. 27.9 45.2 50.7 51.1 47.7 54.6 dB ref. curve (ISO 717) publication is permitted for the entire page only

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Mook, 14-05-1997



Report

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various variants of a relocatable system partition made by Maars Produktie BV (Netherlands)

in the Laboratory for Acoustics of "Adviesbureau Peutz & Associés B.V.", Mook, The Netherlands (see figure 1).

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The construction to be tested has been placed by the principal between two test rooms. The description of the specimen and the construction used are copied from the data e-ceived from the principal.

This partition (dimension w x h x t 4300 x 2800 x 100 mm) exists of a framework on both sides of which wallpanels were fixed .

The framework itself comprises galvanised steel components such as floor- and overheadprofiles, two wall connection profiles and several vertical C-studs.

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The following test variants were carried out:

- A. the basic structure as described above, panel width 1200mm, see figure 2
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4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-3 in the Laboratory for Acoustics of Adviesbureau Peutz & Associés BV in Mook. A detailed description of the test set up has been given in the figure 6 of this report.

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(1)

in which:

- L_1 = sound pressure level in the sending room [dB]
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- equivalent sound absorption $[m^2]$ in the receiving room according to: A =

$$A = \frac{0.16 \cdot V}{T}$$
(2)

in which :

V	=	volume of the receiving room	[m ³]
Т	=	reverberation time in the receiving room	[s]



4.2. Accuracy

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

4.2.1. Repeatability r

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 insulation measurements performed in the laboratories of "Adviesbureau Peutz & Associés" in Mook eight series of measurements have been carried out according to ISO 140-2. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 250 Hz the repeatability r is 2.0 dB as a maximum. For the frequency range 315 to 3150 Hz the repeatability r is 1.3 dB as a maximum.

The repeatability r regarding the single-figure rating R_w is 0.7 dB as a maximum. As ISO 717-1 prescribes rounding of the R_w -values to the nearest dB repeatability r of 1 dB is applicable for the R_w -value.

From these results it may be concluded that the repeatability r as found satisfies the demands of ISO 140-2.

4.2.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories - by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

In ISO 140-2 there is a statement on the reproducibility R to be expected, based on the results of various inter-laboratory tests. The reproducibility of the single figure rating R_w is about 3 dB.



4.3. Results

The results of the measurements are given in table I and in figures 8 to 11

Table I: results of the measurements

	SOUND REDUCTION INDEX R [dB]							
Variant		A		3	С		D	
panel width [mm]	1200		900		900		900	
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400	10.2		24 5		19.6		10.2	
400	49.Z	10.9	34.0	26.7	40.0	40 E	49.3 51.5	50.7
500	49.7 50.7	49.0	37.3	30.7	49.3	49.0	51.0	50.7
030	50.7		40.5		51.0		51.0	
800	50.6		12 9		517		51.8	
1000	50.5	50.5	44.3	43.9	51.4	51.8	51.0	51.1
1250	50.5	00.0	44.7	10.0	52.3	0110	50.5	0
	0010				02.0		0010	
1600	48.3		41.5		50.0		48.5	
2000	43.1	44.1	39.2	40.7	45.3	46.8	47.0	47.7
2500	42.8		41.8	-	46.4		47.8	
3150	47.8		46.2		49.8		51.3	
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R _w (C;C _{tr})	46(-2;-6) dB		39(-2	;-6) dB	48(-2;	-8) dB	49(-2	-7) dB

In the tables and graphs the values of the insulation found are presented in 1/3 octave bands.

From these values the weighted sound reduction index $R_{\rm w}$ according to ISO 717-1 including the spectrum adaptation terms C and $C_{\rm tr}$ have been calculated and stated.

Th. Scheers Leader of the Laboratory Mook, ir. M.L.S Vercammen manager

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report nr. A 691-1E

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49.8

50.5

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ref. curve (ISO 717)

1/3 oct.

Mook, 30-01-1997

44.1

48.7 dB

MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: varaint B Section A-A Section B-B 66) (05) 01 15 (14) Detail C 08 (01) Ceiling & Flaar track 75x63x0.8mm (Q2) Foamtape 3x9mm (03) Adjusting screw with plug 510 a < 500mm (04) Wall track 103x25x0.9mm dB G (05) Wall panel 60 (%) (06) Plasterboard 12.5mm (08) Stud 60x30x1mm (09) Foamtape 2x30mm (08) 50 (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm (13) U-profile &3x50x0.9mm 40 0Z (15) Plasterboard 9.5mm ≌ (03) sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 39(-2;-6) dB$ 0 125 250 500 1k 2k 4k frequency Hz 42.9 22.9 23.0 34.5 46.2 41.5 1/3 oct. 23.3 44.3 39.2 47.8 dB 26.9 37.3 21.4 31.0 40.3 44.7 41.8 47.1 1/1 oct. 1/3 oct. 47.0 dB 1/1 oct. 22.5 25.8 36.7 43.9 40.7 ref. curve (ISO 717) publication is permitted for the entire page only

##:136 a691 file: nsulat versie 1.2.5, mode 1

MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant C Section A-A Section B-B (06) (13) 608 (05) 02 {04 03 ØŹ WWW WWW WWWW (01) 15 (74) Detail ((01) Ceiling & Floor track 15x63x0.8mm (02) Foamtape 3x9nm (03) Adjusting screw with plug \$10 a < 500mm (04) Wall track 103x25x0.9mm (05) Wall panel dB (E) 60 (06) Plasterboard 12.5mm (86) (07) Rockwool pad 20mm (17) (08) Stud 60x30x1mm (09) Foamtape 2x30mm (88) 50 (10) U-profile 10x8x1.5mm (11) Serew 3.5x22mm (12) PVE Infill strip 10x8x1mm (13) U-profile 63x50x0.9mm m (14) Rockwool pad 40mm 40 ≌ 0Ì sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 48(-2;-8) dB$ 0 125 250 500 1k 2k 4k frequency Hz 22.0 40.5 48.6 51.7 50.0 49.8 1/3 oct. 29.5 49.3 45.3 54.3 dB 43.6 51.4 34.7 45.6 51.0 52.3 46.4 58.1 1/1 oct. 1/3 oct. 1/1 oct. 25.9 42.7 49.5 51.8 46.8 52.8 dB ref. curve (ISO 717)

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Mook, 05-03-1997

##:177

a691

MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant D Section B-B Section A-A 663 (oż 25 03 www WWWW www (02) (1) NWWW WWWW WWWW WWW MMM TS) (14) 660 Detail C (*05*) (01) Ceiling & Floor track 75x63x0.8mm (02) Foamtape 3x9mm 66) (03) Adjusting screw with plug 510 a < 500mm (066) (04) Wall track 103x25x0.9mm (05) Wall panel dB 80 (6) Plasterboard 12.5mm (66) Plasterboard 15mm (07) (07) Rockwool pad 20mm (DB) Stud 60x30x1mm (08) 70 (19) Foamtape 2x30mm (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm (II) (13) U-profile 63x50x0.9mm 60 02) ≌ (14) Rockwool pad 40mm Ø3 sound reduction index 50 volume sending room: 94 m³ volume receiving room: 111 m³ 40 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 30 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 49(-2;-7) dB$ 20 125 250 500 1k 2k 4k frequency Hz 24.4 43.0 49.3 51.8 48.5 51.3 1/3 oct. 30.3 51.5 51.0 56.7 dB 46.1 47.0 35.0 47.9 51.8 50.5 47.8 60.6 1/1 oct. 1/3 oct. 1/1 oct. 27.9 45.2 50.7 51.1 47.7 54.6 dB ref. curve (ISO 717) publication is permitted for the entire page only

a691 file: nsulat versie 1.2.5, mode 1

##:305

Mook, 14-05-1997


Report

Member ONRI ISO-9001 certified

Laboratory for Acoustics Determiation of the sound insulatition of several variants of a relocatable system partion type IS made by Maars Production BV

Report number A 691-1E dd. 11 September 2002

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neers), RVOI-1998. KvK: 12028033. BTW: NL004933837B01.

Principal: Maars Produktie BV PO Box 1000 NL-3840 BA Harderwijk

Report number: A 691-1E

Date: 9 october 1997 (translation 11 September 2002)

Ref.: TS/LvB/A 691-1E-RA



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6 6 7 7 7 8



1. INTRODUCTION

At the request of Maars Produktie BV at Harderwijk (Netherlands) sound insulation measurements have been carried out on

various variants of a relocatable system partition made by Maars Produktie BV (Netherlands)

in the Laboratory for Acoustics of "Adviesbureau Peutz & Associés B.V.", Mook, The Netherlands (see figure 1).

Remarks on the occasion of the translation in 2002:

The measurements took place in 1997 and have been reported in the Dutch report A691-1 dated 9 october 1997.

The laboratory in which the measurements took place has been in use since January 1, 1996.

Regarding this laboratory it has been proved to be in accordance with ISO 140-1:1997 (this was part of the accreditation as a test laboratory *ac*-cording to EN45001, later: EN ISO/IEC 17025). The laboratory and the Quality System of it complied to the accreditation criteria and as a result it was *ac*-credited so in feb 2000.

Where applicable the single value ratings R_W according to ISO 717-1 have been determined in 2002 according to the 1999 edition of that norm



2. NORMS AND GUIDELINES

The measurements have been carried out according to:

ISO 140-3:1995Acoustics - Measurements of sound insulation in buildings and of building elements: Part 3: Laboratory measurements of airborne sound insulation of building elementsNOTE:this international standard has been accepted within all EU-countries as
European Norm EN ISO 140-3:1995

Various other related norms:

ISO 140-1:1997	Acoustics - Measurement of sound insulation of building elements - Part 1: Requirements for laboratory test facilities with suppressed flanking transmission
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN ISO 140-1:1997
ISO 140-2:1991	Acoustics - Measurement of sound insulation of building elements - Part 2: Determination, verification and application of precision data
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN 20140-2:1993
ISO 717-1:1996	Acoustics - Rating of sound insulation in buildings and of building ele- ments - Part 1: Airborne sound insulation
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN ISO 717-1:1996



3. TESTED CONSTRUCTIONS

The construction to be tested has been placed by the principal between two test rooms. The description of the specimen and the construction used are copied from the data e-ceived from the principal.

This partition (dimension w x h x t 4300 x 2800 x 100 mm) exists of a framework on both sides of which wallpanels were fixed .

The framework itself comprises galvanised steel components such as floor- and overheadprofiles, two wall connection profiles and several vertical C-studs.

Within the W-shaped floor- and overhead-profiles of 1mm thick there are two stripes of 9.5mm thick gypsumboard.

The vertical wall connection profiles are composed of two separate U-shaped steel profiles in which the wall panels were shifted.

The vertical C-studs were made of 1.5mm thick, perforated steel

On the back of the perimeter profiles self-adhesive PVC foam tape (6 x 9mm semi-closed cells) has been fixed

The wall-panels exist of an outer plating of 0.9mm steel onto which a 12.5mm thick plasterboard has been glued. The gypsum side of the panels is covered with 20mm thick Rockwool type 211. The panels were fixed to the framework using screwed U-shaped profiles.

The following test variants were carried out:

- A. the basic structure as described above, panel width 1200mm, see figure 2
- B. the basic structure as described above, panel width 900mm, but no rockwool in the wall cavity nor in the bottom- and overhead profiles, see figure 3
- C. the basic structure as described above, panel width 900mm, see figure 4
- D. like C, but one side of the wall panels with 15mm thick plasterboard instead of 12.5mm, see figure 5



4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-3 in the Laboratory for Acoustics of Adviesbureau Peutz & Associés BV in Mook. A detailed description of the test set up has been given in the figure 6 of this report.

The construction to be tested is placed into a test opening between two measuring rooms. In one of the rooms (the so-called sending room) broad-band noise is generated by loudspeakers.

In this sending room as well as in the adjacent room (the "receiving room") the resulting sound pressure level is measured by means of a continuous rotating boom, so the (timeand space-) averaged sound pressure level is determined.

The reverberation time of the receiving room is also measured.

The instruments and the method used meet the requirements of ISO 140-3

As allowed by the test method the test procedure is repeated reversing the sending and receiving rooms. The reported value of each sound insulation is the arithmetic average of the two results.

In ISO 140-3 the airborne sound insulation of an object is defined as the "sound reduction index R" to be evaluated according to formula 1 and expressed in dB:

$$R = L_1 - L_2 + 10 \log\left(\frac{S}{A}\right)$$
(1)

in which:

- L_1 = sound pressure level in the sending room [dB]
- L_2 = sound pressure level in the receiving room [dB] [m²]
- S = area of the object to be tested
- equivalent sound absorption $[m^2]$ in the receiving room according to: A =

$$A = \frac{0.16 \cdot V}{T}$$
(2)

in which :

V	=	volume of the receiving room	[m ³]
Т	=	reverberation time in the receiving room	[s]



4.2. Accuracy

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

4.2.1. Repeatability r

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 insulation measurements performed in the laboratories of "Adviesbureau Peutz & Associés" in Mook eight series of measurements have been carried out according to ISO 140-2. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 250 Hz the repeatability r is 2.0 dB as a maximum. For the frequency range 315 to 3150 Hz the repeatability r is 1.3 dB as a maximum.

The repeatability r regarding the single-figure rating R_w is 0.7 dB as a maximum. As ISO 717-1 prescribes rounding of the R_w -values to the nearest dB repeatability r of 1 dB is applicable for the R_w -value.

From these results it may be concluded that the repeatability r as found satisfies the demands of ISO 140-2.

4.2.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories - by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

In ISO 140-2 there is a statement on the reproducibility R to be expected, based on the results of various inter-laboratory tests. The reproducibility of the single figure rating R_w is about 3 dB.



4.3. Results

The results of the measurements are given in table I and in figures 8 to 11

Table I: results of the measurements

	SOUND REDUCTION INDEX R [dB]							
Variant		A		3	С		D	
panel width [mm]	1200		900		900		900	
rockwool in cavity	ye	es	n	0	yes		yes	
gypsum board	2 x 12	2 x 12.5mm		2.5mm	2 x 12.5mm		1x15 n	nm and
							1x12	.5mm
figure	-	7		8	Ç	9	1	0
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	22.1		22.9		22.0		24.4	
125	28.6	25.7	23.3	22.5	29.5	25.9	30.3	27.9
160	32.5		21.4		34.7		35.0	
					40 5		40.0	
200	39.5	40.0	23.0	05.0	40.5	40.7	43.0	45.0
250	44.5	42.6	26.9	25.8	43.6	42.7	46.1	45.2
315	47.9		31.0		45.6		47.9	
400	40.2		24 5		19.6		10.2	
400	49.Z	10.9	34.0	26.7	40.0	40 E	49.3 51.5	50.7
500	49.7 50.7	49.0	37.3	30.7	49.3	49.0	51.0	50.7
030	50.7		40.5		51.0		51.0	
800	50.6		12 9		517		51.8	
1000	50.5	50.5	44.3	43.9	51.4	51.8	51.0	51.1
1250	50.5	00.0	44.7	10.0	52.3	0110	50.5	0
	0010				02.0		0010	
1600	48.3		41.5		50.0		48.5	
2000	43.1	44.1	39.2	40.7	45.3	46.8	47.0	47.7
2500	42.8		41.8	-	46.4		47.8	
3150	47.8		46.2		49.8		51.3	
4000	50.3	48.7	47.8	47.0	54.3	52.8	56.7	54.6
5000	48.3		47.1		58.1		60.6	
R _w (C;C _{tr})	46(-2;-6) dB		39(-2	;-6) dB	48(-2;	-8) dB	49(-2	-7) dB

In the tables and graphs the values of the insulation found are presented in 1/3 octave bands.

From these values the weighted sound reduction index $R_{\rm w}$ according to ISO 717-1 including the spectrum adaptation terms C and $C_{\rm tr}$ have been calculated and stated.

Th. Scheers Leader of the Laboratory Mook, ir. M.L.S Vercammen manager

This report contains: 8 page(s) and 11 figures



ADVIESBUREAU PEUTZ & ASSOCIES B.V. Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), NETHERLANDS



PEUTZ









DEUTZ



report nr. A 691-1E

DEUTZ



99



1/1 oct. 25.7

42.6

49.8

50.5

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ref. curve (ISO 717)

1/3 oct.

Mook, 30-01-1997

44.1

48.7 dB

MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: varaint B Section A-A Section B-B 66) (05) 01 15 (14) Detail C 08 (01) Ceiling & Flaar track 75x63x0.8mm (Q2) Foamtape 3x9mm (03) Adjusting screw with plug 510 a < 500mm (04) Wall track 103x25x0.9mm dB G (05) Wall panel 60 (%) (06) Plasterboard 12.5mm (08) Stud 60x30x1mm (09) Foamtape 2x30mm (08) 50 (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm (13) U-profile &3x50x0.9mm 40 0Z (15) Plasterboard 9.5mm ≌ (03) sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 39(-2;-6) dB$ 0 125 250 500 1k 2k 4k frequency Hz 42.9 22.9 23.0 34.5 46.2 41.5 1/3 oct. 23.3 44.3 39.2 47.8 dB 26.9 37.3 21.4 31.0 40.3 44.7 41.8 47.1 1/1 oct. 1/3 oct. 47.0 dB 1/1 oct. 22.5 25.8 36.7 43.9 40.7 ref. curve (ISO 717) publication is permitted for the entire page only

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Mook, 05-03-1997

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MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant D Section B-B Section A-A 663 (oż 25 03 www WWWW www (02) (1) NWWW WWWW WWWW WWW MMM TS) (14) 660 Detail C (*05*) (01) Ceiling & Floor track 75x63x0.8mm (02) Foamtape 3x9mm 66) (03) Adjusting screw with plug 510 a < 500mm (066) (04) Wall track 103x25x0.9mm (05) Wall panel dB 80 (6) Plasterboard 12.5mm (66) Plasterboard 15mm (07) (07) Rockwool pad 20mm (DB) Stud 60x30x1mm (08) 70 (19) Foamtape 2x30mm (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm 1 (13) U-profile 63x50x0.9mm 60 02) ≌ (14) Rockwool pad 40mm Ø3 sound reduction index 50 volume sending room: 94 m³ volume receiving room: 111 m³ 40 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 30 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 49(-2;-7) dB$ 20 125 250 500 1k 2k 4k frequency Hz 24.4 43.0 49.3 51.8 48.5 51.3 1/3 oct. 30.3 51.5 51.0 56.7 dB 46.1 47.0 35.0 47.9 51.8 50.5 47.8 60.6 1/1 oct. 1/3 oct. 1/1 oct. 27.9 45.2 50.7 51.1 47.7 54.6 dB ref. curve (ISO 717) publication is permitted for the entire page only

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##:305

Mook, 14-05-1997



Report

Member ONRI ISO-9001 certified

Laboratory for Acoustics Determiation of the sound insulatition of several variants of a relocatable system partion type IS made by Maars Production BV

Report number A 691-1E dd. 11 September 2002

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Principal: Maars Produktie BV PO Box 1000 NL-3840 BA Harderwijk

Report number: A 691-1E

Date: 9 october 1997 (translation 11 September 2002)

Ref.: TS/LvB/A 691-1E-RA



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1. INTRODUCTION

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various variants of a relocatable system partition made by Maars Produktie BV (Netherlands)

in the Laboratory for Acoustics of "Adviesbureau Peutz & Associés B.V.", Mook, The Netherlands (see figure 1).

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3. TESTED CONSTRUCTIONS

The construction to be tested has been placed by the principal between two test rooms. The description of the specimen and the construction used are copied from the data e-ceived from the principal.

This partition (dimension w x h x t 4300 x 2800 x 100 mm) exists of a framework on both sides of which wallpanels were fixed .

The framework itself comprises galvanised steel components such as floor- and overheadprofiles, two wall connection profiles and several vertical C-studs.

Within the W-shaped floor- and overhead-profiles of 1mm thick there are two stripes of 9.5mm thick gypsumboard.

The vertical wall connection profiles are composed of two separate U-shaped steel profiles in which the wall panels were shifted.

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On the back of the perimeter profiles self-adhesive PVC foam tape (6 x 9mm semi-closed cells) has been fixed

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The following test variants were carried out:

- A. the basic structure as described above, panel width 1200mm, see figure 2
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- C. the basic structure as described above, panel width 900mm, see figure 4
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4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-3 in the Laboratory for Acoustics of Adviesbureau Peutz & Associés BV in Mook. A detailed description of the test set up has been given in the figure 6 of this report.

The construction to be tested is placed into a test opening between two measuring rooms. In one of the rooms (the so-called sending room) broad-band noise is generated by loudspeakers.

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$$R = L_1 - L_2 + 10 \log\left(\frac{S}{A}\right)$$
(1)

in which:

- L_1 = sound pressure level in the sending room [dB]
- L_2 = sound pressure level in the receiving room [dB] [m²]
- S = area of the object to be tested
- equivalent sound absorption $[m^2]$ in the receiving room according to: A =

$$A = \frac{0.16 \cdot V}{T}$$
(2)

in which :

V	=	volume of the receiving room	[m ³]
Т	=	reverberation time in the receiving room	[s]



4.2. Accuracy

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

4.2.1. Repeatability r

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 insulation measurements performed in the laboratories of "Adviesbureau Peutz & Associés" in Mook eight series of measurements have been carried out according to ISO 140-2. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 250 Hz the repeatability r is 2.0 dB as a maximum. For the frequency range 315 to 3150 Hz the repeatability r is 1.3 dB as a maximum.

The repeatability r regarding the single-figure rating R_w is 0.7 dB as a maximum. As ISO 717-1 prescribes rounding of the R_w -values to the nearest dB repeatability r of 1 dB is applicable for the R_w -value.

From these results it may be concluded that the repeatability r as found satisfies the demands of ISO 140-2.

4.2.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories - by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

In ISO 140-2 there is a statement on the reproducibility R to be expected, based on the results of various inter-laboratory tests. The reproducibility of the single figure rating R_w is about 3 dB.



4.3. Results

The results of the measurements are given in table I and in figures 8 to 11

Table I: results of the measurements

	SOUND REDUCTION INDEX R [dB]							
Variant		A		3	С		D	
panel width [mm]	1200		900		900		900	
rockwool in cavity	ye	es	n	0	yes		yes	
gypsum board	2 x 12	2 x 12.5mm		2.5mm	2 x 12.5mm		1x15 n	nm and
							1x12	.5mm
figure	-	7		8	Ç	9	1	0
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	22.1		22.9		22.0		24.4	
125	28.6	25.7	23.3	22.5	29.5	25.9	30.3	27.9
160	32.5		21.4		34.7		35.0	
					40 5		40.0	
200	39.5	40.0	23.0	05.0	40.5	40.7	43.0	45.0
250	44.5	42.6	26.9	25.8	43.6	42.7	46.1	45.2
315	47.9		31.0		45.6		47.9	
400	10.2		24 5		19.6		10.2	
400	49.Z	10.9	34.0	26.7	40.0	40 E	49.3 51.5	50.7
500	49.7 50.7	49.0	37.3	30.7	49.3	49.0	51.0	50.7
030	50.7		40.5		51.0		51.0	
800	50.6		12 9		517		51.8	
1000	50.5	50.5	44.3	43.9	51.4	51.8	51.0	51.1
1250	50.5	00.0	44.7	10.0	52.3	0110	50.5	0
	0010				02.0		0010	
1600	48.3		41.5		50.0		48.5	
2000	43.1	44.1	39.2	40.7	45.3	46.8	47.0	47.7
2500	42.8		41.8	-	46.4		47.8	
3150	47.8		46.2		49.8		51.3	
4000	50.3	48.7	47.8	47.0	54.3	52.8	56.7	54.6
5000	48.3		47.1		58.1		60.6	
R _w (C;C _{tr})	46(-2;-6) dB		39(-2	;-6) dB	48(-2;	-8) dB	49(-2	-7) dB

In the tables and graphs the values of the insulation found are presented in 1/3 octave bands.

From these values the weighted sound reduction index $R_{\rm w}$ according to ISO 717-1 including the spectrum adaptation terms C and $C_{\rm tr}$ have been calculated and stated.

Th. Scheers Leader of the Laboratory Mook, ir. M.L.S Vercammen manager

This report contains: 8 page(s) and 11 figures



ADVIESBUREAU PEUTZ & ASSOCIES B.V. Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), NETHERLANDS



PEUTZ









DEUTZ



report nr. A 691-1E

DEUTZ



99



1/1 oct. 25.7

42.6

49.8

50.5

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ref. curve (ISO 717)

1/3 oct.

Mook, 30-01-1997

44.1

48.7 dB

MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: varaint B Section A-A Section B-B 66) (05) 01 15 (14) Detail C 08 (01) Ceiling & Flaar track 75x63x0.8mm (Q2) Foamtape 3x9mm (03) Adjusting screw with plug 510 a < 500mm (04) Wall track 103x25x0.9mm dB G (05) Wall panel 60 (%) (06) Plasterboard 12.5mm (08) Stud 60x30x1mm (09) Foamtape 2x30mm (08) 50 (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm (13) U-profile &3x50x0.9mm 40 0Z (15) Plasterboard 9.5mm ≌ (03) sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 39(-2;-6) dB$ 0 125 250 500 1k 2k 4k frequency Hz 42.9 22.9 23.0 34.5 46.2 41.5 1/3 oct. 23.3 44.3 39.2 47.8 dB 26.9 37.3 21.4 31.0 40.3 44.7 41.8 47.1 1/1 oct. 1/3 oct. 47.0 dB 1/1 oct. 22.5 25.8 36.7 43.9 40.7 ref. curve (ISO 717) publication is permitted for the entire page only

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MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant C Section A-A Section B-B (06) (13) 608 (05) 02 {04 03 ØŹ WWW WWW WWWW (01) 15 (74) Detail ((01) Ceiling & Floor track 15x63x0.8mm (02) Foamtape 3x9nm (03) Adjusting screw with plug \$10 a < 500mm (04) Wall track 103x25x0.9mm (05) Wall panel dB (E) 60 (06) Plasterboard 12.5mm (86) (07) Rockwool pad 20mm (17) (08) Stud 60x30x1mm (09) Foamtape 2x30mm (88) 50 (10) U-profile 10x8x1.5mm (11) Serew 3.5x22mm (12) PVE Infill strip 10x8x1mm (13) U-profile 63x50x0.9mm m (14) Rockwool pad 40mm 40 ≌ 0Ì sound reduction index 30 volume sending room: 94 m³ volume receiving room: 111 m³ 20 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 10 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 48(-2;-8) dB$ 0 125 250 500 1k 2k 4k frequency Hz 22.0 40.5 48.6 51.7 50.0 49.8 1/3 oct. 29.5 49.3 45.3 54.3 dB 43.6 51.4 34.7 45.6 51.0 52.3 46.4 58.1 1/1 oct. 1/3 oct. 1/1 oct. 25.9 42.7 49.5 51.8 46.8 52.8 dB ref. curve (ISO 717)

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Mook, 05-03-1997

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MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995 principal: Maars Produktie BV construction tested: variant D Section B-B Section A-A 663 (oż 25 03 www WWWW www (02) (1) NWWW WWWW WWWW WWW MMM TS) (14) 660 Detail C (*05*) (01) Ceiling & Floor track 75x63x0.8mm (02) Foamtape 3x9mm 66) (03) Adjusting screw with plug 510 a < 500mm (066) (04) Wall track 103x25x0.9mm (05) Wall panel dB 80 (6) Plasterboard 12.5mm (66) Plasterboard 15mm (07) (07) Rockwool pad 20mm (DB) Stud 60x30x1mm (08) 70 (19) Foamtape 2x30mm (10) U-profile 10x8x1.5mm (11) Screw 3.5x22mm (12) PVC Infill strip 10x8x1mm (II) (13) U-profile 63x50x0.9mm 60 02) ≌ (14) Rockwool pad 40mm Ø3 sound reduction index 50 volume sending room: 94 m³ volume receiving room: 111 m³ 40 surface area tested partition: 12 m² measured at: laboratory conditions signal: broad-band noise 30 bandwidth: 1/3 octave ISO 717-1:1996 $R_w(C;C_{tr}) = 49(-2;-7) dB$ 20 125 250 500 1k 2k 4k frequency Hz 24.4 43.0 49.3 51.8 48.5 51.3 1/3 oct. 30.3 51.5 51.0 56.7 dB 46.1 47.0 35.0 47.9 51.8 50.5 47.8 60.6 1/1 oct. 1/3 oct. 1/1 oct. 27.9 45.2 50.7 51.1 47.7 54.6 dB ref. curve (ISO 717) publication is permitted for the entire page only

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Mook, 14-05-1997


Report

Lid ONRI ISO-9001 gecertificeerd

Laboratory for Acoustis Determination of the sound insulation of a relocatable system partition type Intersign (IS); manufactured by Maars

Report number A 1070-1E dd. 16 October 2002

Principal: Maars Holding BV

Report number: A 1070-1E

Date: 7 January 2002 (translated 16 October 2002)

Ref.: TS/LvB/A 1070-1E-RA

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1. INTRODUCTION

At the request of Maars Holding BV at Harderwijk (Netherlands) sound insulation measurements have been carried out on a

relocatable system partition type Intersign (IS) manufactured by Maars (Netherlands)

in the Laboratory for Acoustics of "Adviesbureau Peutz & Associés B.V.", 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". The accreditation has been registered in the "STERLAB" register for testing laboratories



2. NORMS AND GUIDELINES

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

ISO 140-3:1995	Acoustics - Measurements of sound insulation in buildings and of buil-
	ding elements: Part 3: Laboratory measurements of airborne sound in-
	sulation of building elements
NOTE:	this international standard has been accepted within all EU-countries as
	European Norm EN ISO 140-3:1995

Various other related norms:

ISO 140-1:1997	Acoustics - Measurement of sound insulation of building elements - Part 1: Requirements for laboratory test facilities with suppressed flanking transmission
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN ISO 140-1:1997
ISO 140-2:1991	Acoustics - Measurement of sound insulation of building elements - Part 2: Determination, verification and application of precision data
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN 20140-2:1993
ISO 717-1:1996	Acoustics - Rating of sound insulation in buildings and of building ele- ments - Part 1: Airborne sound insulation
NOTE:	this international standard has been accepted within all EU-countries as European Norm EN ISO 717-1:1996



3. TESTED CONSTRUCTIONS

The construction to be tested has been placed by the principal between two test rooms. The description of the specimen and the construction used are copied from the data e-ceived from the principal.

The measurements have been carried out on a relocatable system partition type Intersign (IS), dimensions width x height x thickness 4297 x 2796 x 99 mm. The partition exists of a frame covered on both sides with chipboard panels with rockwool pads mounted into the cavity between them.

Within the perimeter of the test opening a frame has been constructed existing of:

- one ceiling and one floor track, W-shaped steel of 1 mm thickness in which 2 straps of plaster board 12,5mm have been mounted
- two wall tracks
- four metal vertical studs 30x60mm, 1200 mm between centers

acoustic foam tape3x9mm has been applied between the perimeter of the test opening and the steel profiles

one side of the partition was covered with panels of 18 mm thick chipboard (veneered on one side) total mass of the panels: 11.6 kg/m^2

by means of screwed U-section, steel profiles (omega profiles) the panels have been connected to the frame

the channel in the omega profile has been filled up with a PVC infill

between the vertical profiles pads of Rockwool type 201, 40 mm thick, mass ca. 35 kg/m³ have been applied

finally the partition is closed by applying identical panels to the other side of the frame

Conducted tests (see also figure 2 to 5):

- 1. partition as described above
- 2. the same partition with Rockwool 60 mm type 201 instead of 40 mm in the cavity
- the same as #1; the wall panels on one side of the partition strengthened with one layer of gypsum board 9.5 mm thick
- 4. the same as #1; the wall panels on both sides of the partition strengthened with one layer of gypsum board 9.5 mm thick



4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-3 in the Laboratory for Acoustics of Adviesbureau Peutz & Associés BV in Mook. A detailed description of the test set up has been given in the figure 6 of this report.

The construction to be tested is placed into a test opening between two measuring rooms. In one of the rooms (the so-called sending room) loudspeakers generate broadband noise.

In this sending room as well as in the adjacent room (the "receiving room") the resulting sound pressure level is measured by means of a continuous rotating boom, so the (timeand space-) averaged sound pressure level is determined.

The reverberation time of the receiving room is also measured.

The instruments and the method used meet the requirements of ISO 140-3

As allowed by the test method the test procedure is repeated reversing the sending and receiving rooms. The reported value of each sound insulation is the arithmetic average of the two results.

In ISO 140-3 the airborne sound insulation of an object is defined as the "sound reduction index R" to be evaluated according to formula 1 and expressed in dB:

$$R = L_1 - L_2 + 10 \lg \left(\frac{S}{A}\right)$$
(1)

in which:

-1 =	sound pressure level in the sending room	[dB]
------	--	------

- L_2 = sound pressure level in the receiving room [dB] [m²]
- S = area of the object to be tested

equivalent sound absorption [m²] in the receiving room according to: A =

$$A = \frac{0.16 \cdot V}{T}$$
(2)

in which :

V	=	volume of the receiving room	[m ³]
Г	=	reverberation time in the receiving room	[s]

4.2. Accuracy

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



4.2.1. Repeatability r

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 insulation measurements performed in the laboratories of "Adviesbureau Peutz & Associés" in Mook eight series of measurements have been carried out according to ISO 140-2. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 250 Hz the repeatability r is 2.0 dB as a maximum. For the frequency range 315 to 3150 Hz the repeatability r is 1.3 dB as a maximum.

The repeatability r regarding the single-figure rating R_w is 0.7 dB as a maximum. As ISO 717-1 prescribes rounding of the R_w -values to the nearest dB repeatability r of 1 dB is applicable for the R_w -value.

From these results it may be concluded that the repeatability r as found satisfies the demands of ISO 140-2.

4.2.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories - by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

In ISO 140-2 there is a statement on the reproducibility R to be expected, based on the results of various inter-laboratory tests. The reproducibility of the single figure rating R_w is about 3 dB.

4.3. Environmental conditions during the tests

room	Temperature	relative humidity
	[°C]	[%]
1	15	66
2	15	61



4.4. Results

The results of the measurements are given in table I and in figures 7 to 10

	SOUND REDUCTION INDEX R [dB]							
Variant	1		2	2	3		4	
side 1	18 mm c	hipboard	18 mm c	mm chipboard 18 mm chipboard +9.5 mm gyp- sumboard		hipboard im gyp- board	18 mm chipboard +9.5 mm gyp- sumboard	
inside the cavity	40 mm rockwool		60 mm r	ockwool	40 mm rockwool		40 mm rockwool	
side 2	18 mm chipboard		18 mm chipboard		18 mm c	hipboard	18 mm c +9.5 m sumb	hipboard im gyp- board
see figure	-	7	8 9		1	0		
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.
100 125 160	22.5 19.3 27.7	22.0	18.9 23.1 29.8	22.0	24.0 24.3 33.4	25.7	26.2 29.2 37.6	29.0
200 250 315	32.8 38.6 42.9	36.2	35.2 39.2 43.7	38.1	37.4 41.4 44.7	40.2	41.2 44.3 47.5	43.6
400 500 630	47.2 49.2 50.4	48.7	49.2 50.5 50.7	50.1	48.0 50.0 51.4	49.6	49.9 51.1 52.3	51.0
800 1000 1250	50.2 51.1 52.0	51.0	51.5 52.4 53.1	52.3	51.8 52.4 53.9	52.6	52.8 53.2 55.1	53.6
1600 2000 2500	45.8 41.7 44.5	43.7	48.0 43.9 46.4	45.8	51.7 49.9 51.8	51.0	55.3 55.7 57.4	56.0
3150 4000 5000	49.8 55.4 59.4	53.2	51.2 57.2 60.8	54.6	53.8 58.7 61.0	56.8	58.4 61.2 62.2	60.3
R _w (C;C _{tr})	44(-3;	-3;-8) dB 46(-9) dB	49(-3;	-9) dB	52(-3;	-9) dB

Table I: results of the measurements

In the table and graphs the values of the insulation found are presented in 1/3 octave bands. From these values the weighted sound reduction index R_w according to ISO 717-1 including the spectrum adaptation terms C and C_{tr} have been calculated and stated.

Mook,

ir. M.L.S Vercammen manager

Th. Scheers Leader of the Laboratory

This report contains: 8 page(s) and 10 figures



ADVIESBUREAU PEUTZ & ASSOCIES B.V. Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), NETHERLANDS







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figure 8



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figure 10

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