



CONSIGLIO NAZIONALE DELLE RICERCHE
ITC
Istituto per le Tecnologie della Costruzione

RAPPORTO TECNICO

N° 2006.01.03.0101

The following document is a translation in English language of the Original

TEST REPORT on Acoustic behaviour of “ AUTOMATIC DOOR BOTTOM SEALS “

The Original Test Report in Italian Language has to be referred to as the only Officially Released by a Notified Body

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

1. PURCHASER

Domatic s.r.l. Altopascio (LU) , 55011 , Traversa Via delle Cerbaie , n. 52

2. ABSTRACT

The purpose of this work is to study the acoustic behaviour of ten different models of “ Automatic door bottom seal “ produced by Domatic , evaluating the acoustic insulation in respect to airborne noise .

The selected specimens have been tested at the test laboratories of ITC-CNR , Consiglio Nazionale Delle Ricerche , Istituto per le Tecnologie della Costruzione , in order to evaluate the acoustic insulation of small elements ,(Dn,e) , according to the standards UNI EN ISO 20140 -10 and UNI EN ISO 717-1 .

3. TEST SET-UP

Every specimen of “ Automatic door bottom seal “ to be tested has been inserted into a special holder . The HOLDER is then inserted into a test hole obtained into the wall dividing the sending room from the receiving room .

For every specimen a specifically designed wedge-shaped device is used to drive the gasket down in the closed position .

The Dividing Wall , that separate the test room in two parts , have the following dimensions :

- nominal width : 331 centimetre
- nominal height : 300 centimetre
- nominal thickness : 19,3 centimetre
- net acoustic surface : 9,93 square meter

The dividing wall structure consist of a double iron frame , realized with vertical and horizontal profiles , u shaped , each 5 centimetre thick ; a gap of one centimetre has been left internally between the two iron frames .

The vertical and horizontal profiles are joined together by screws .

Both the external sides of the double frame have been covered with a self-adhesive 40 millimetre thick gaskets .

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The double frame is bounded by a rubber gasket one millimetre thick and fixed by screws to the test room . The gap between the two iron frames is filled with glass-wool .

The external surface of the dividing wall , both sending and receiving side , is built up using plaster plates (gypsum plates) , twelve and a half millimetre of thickness .

The plaster plates are screwed to the vertical profiles of the metal frame .

The dividing wall is fixed to the test room as explained above . A test hole has been left in the dividing wall suitable to lodge a specimen holder .

Figures 2 and 3 show the sending and receiving side of the dividing wall .

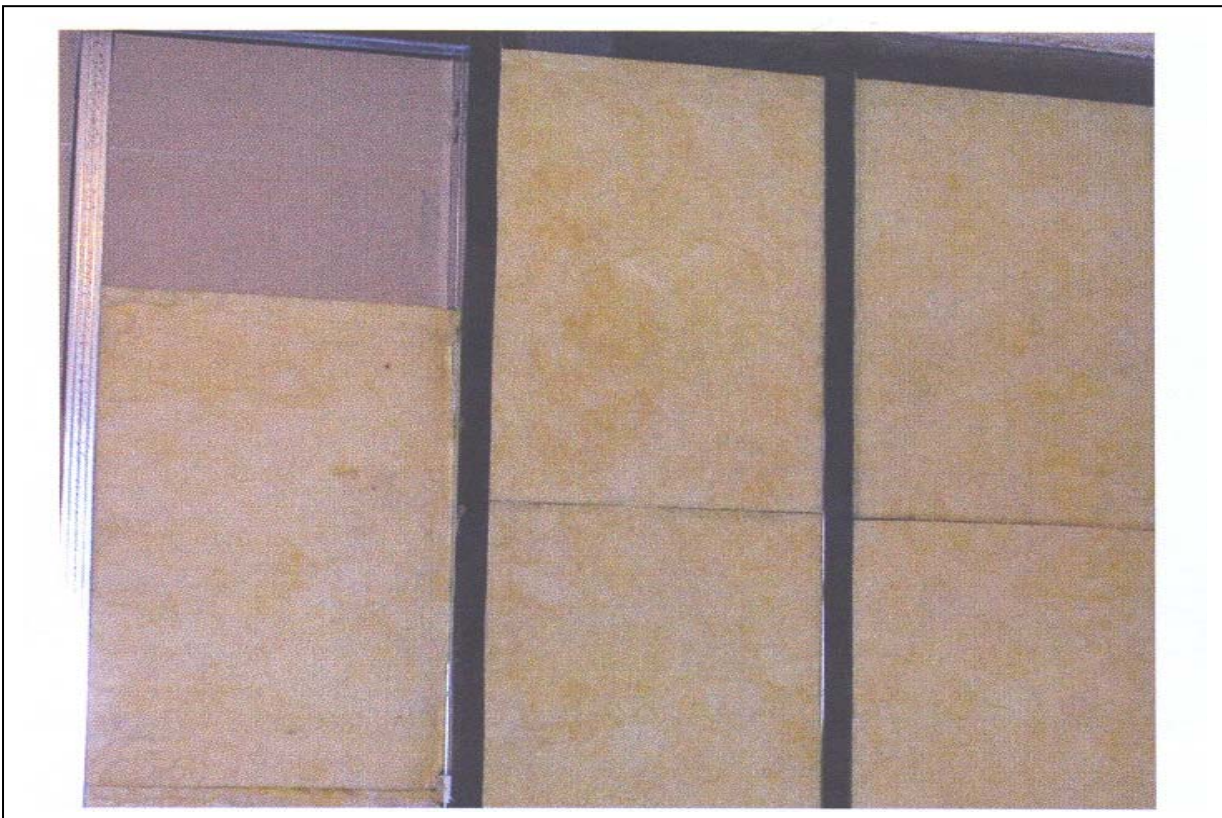


Fig. 1 – Dividing Wall during the assembling

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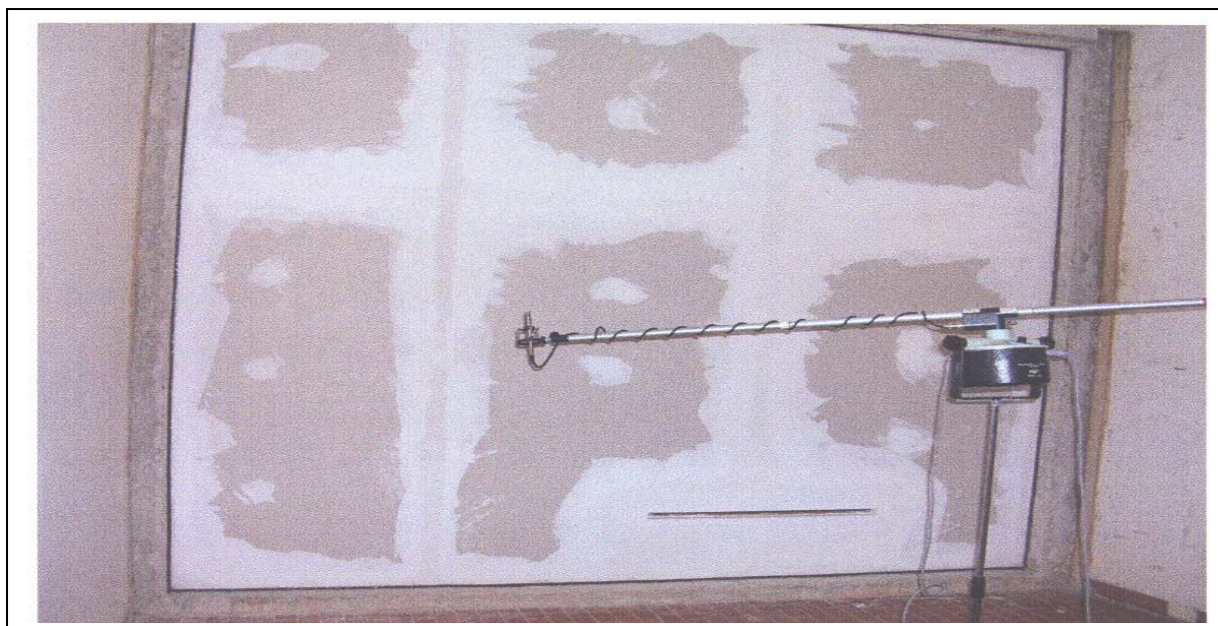


Fig. 2 – The Dividing Wall seen from the sending room side

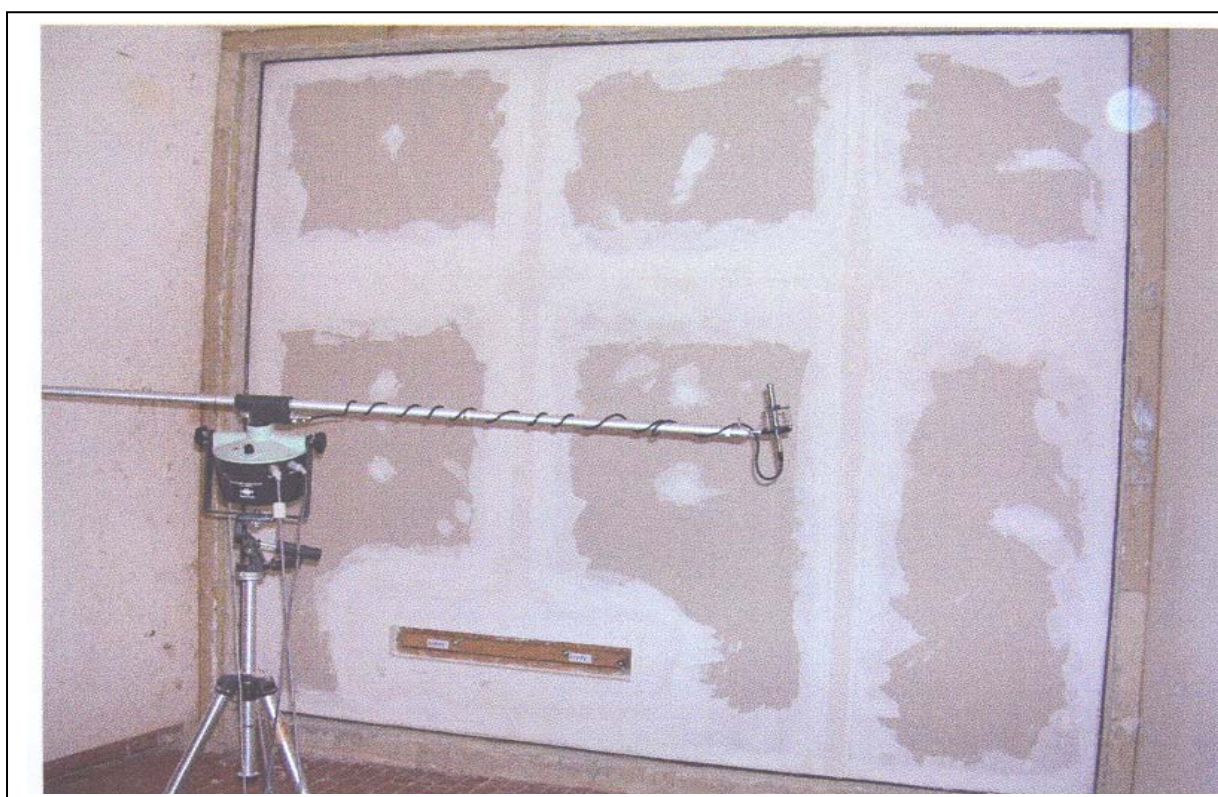


Fig. 3 – The Dividing Wall seen from the receiving room side

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5 TEST SET DESCRIPTION

Specimen Holder

The Holder is made of Iroko wood ; figures 4 and 5 show the vertical cross section and the three dimensional view

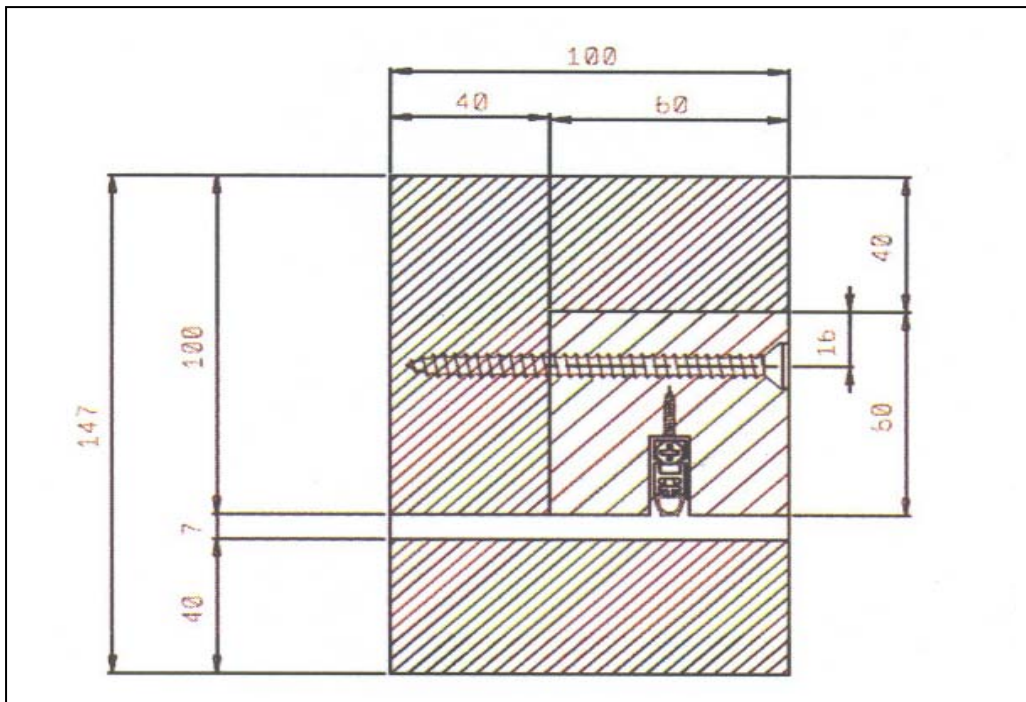


Fig. 4 Holder : vertical cross section

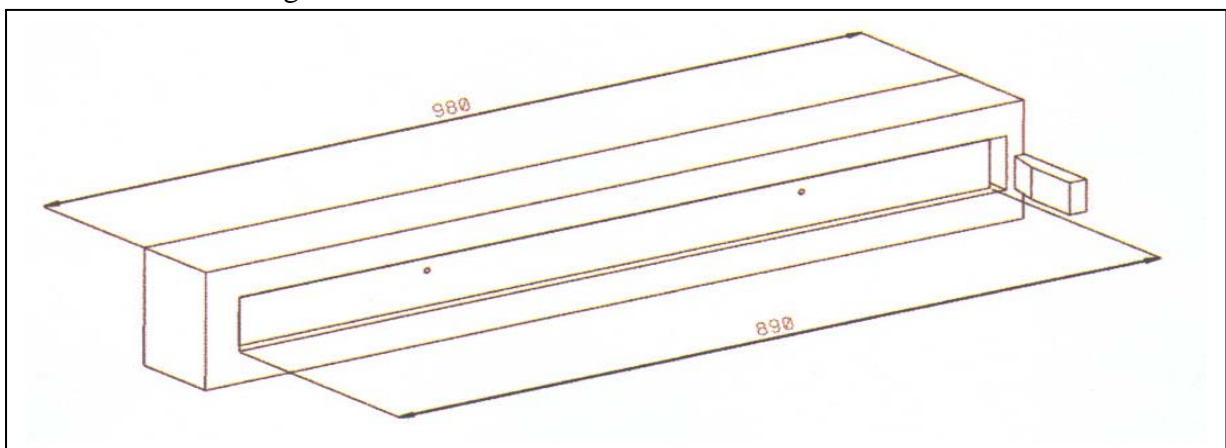


Fig. 5 Holder : three dimensional view

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The figures 6 and 7 show the holder surfaces on the receiving and the transmitting side .

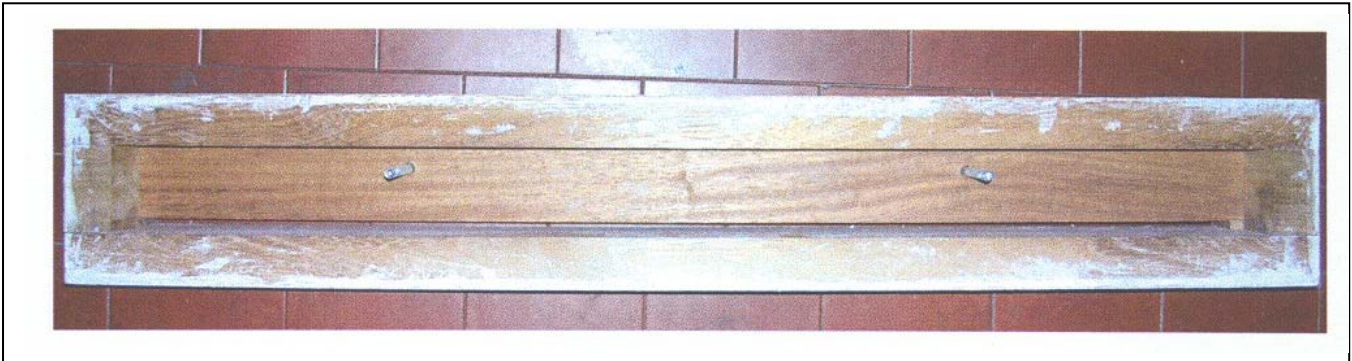


Fig. 6 Holder seat to fit the specimen

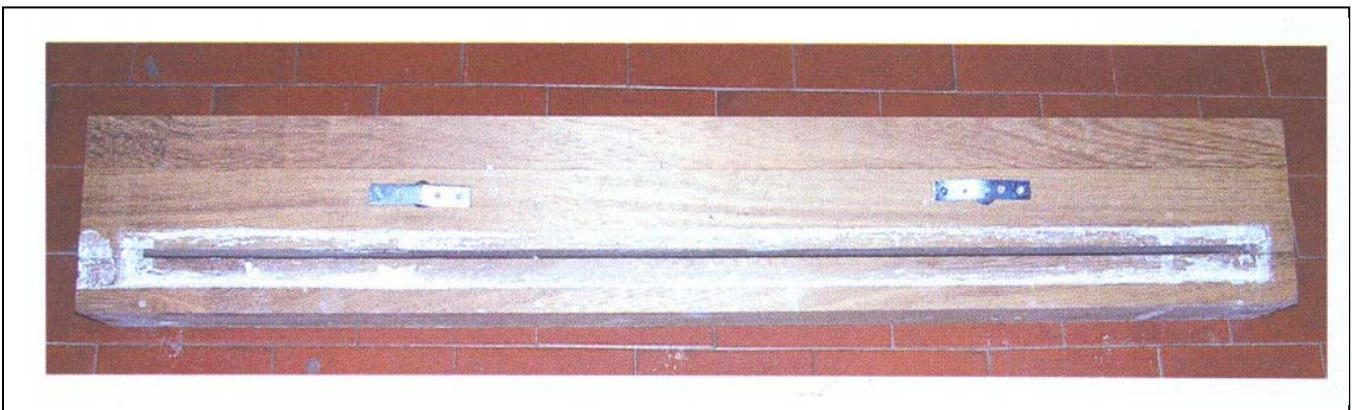


Fig. 7 Holder : slot opened to the sending side , height 7 mm .

In order to measure the acoustic insulation of the dividing wall , the test hole in the dividing wall with the specimen holder installed has been completely plugged using two elements made of fibre- glass reinforced plaster .

The inner border of these two elements has been insulated with a rubber gasket and silicon sealant has been used to improve the overall sound proofing .

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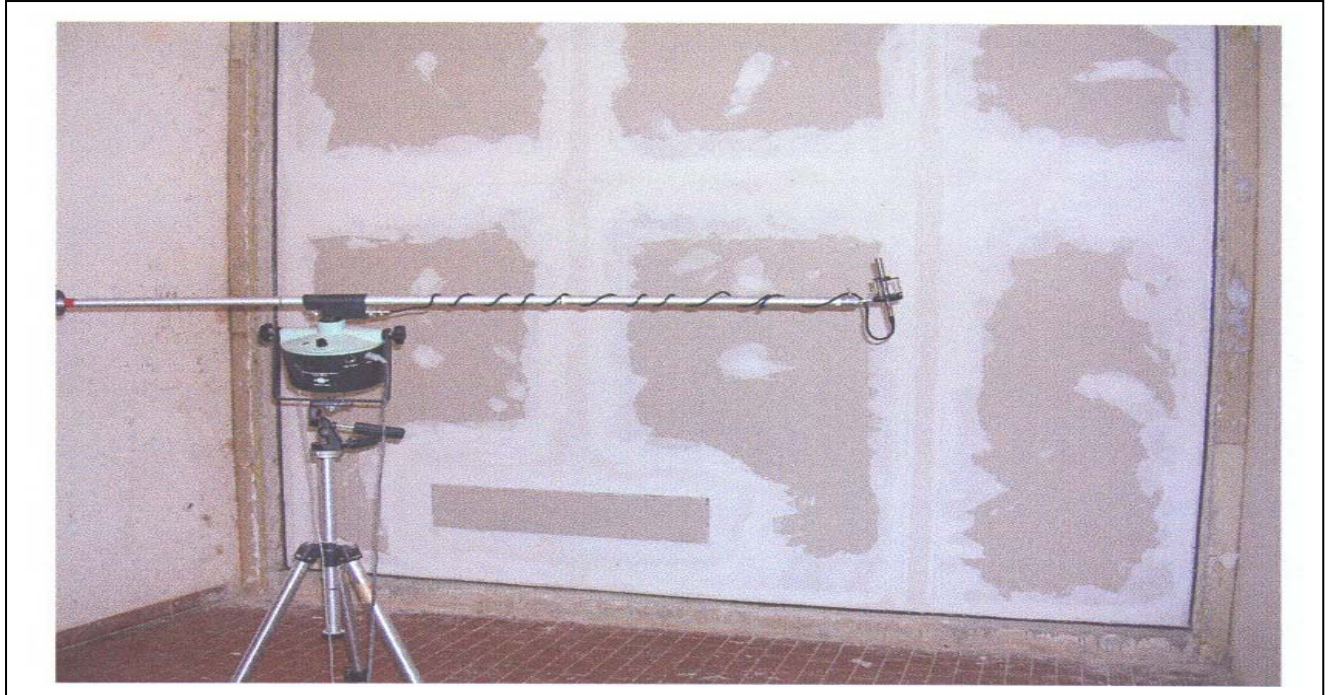


Fig. 8 Dividing wall completely sealed , receiving room side

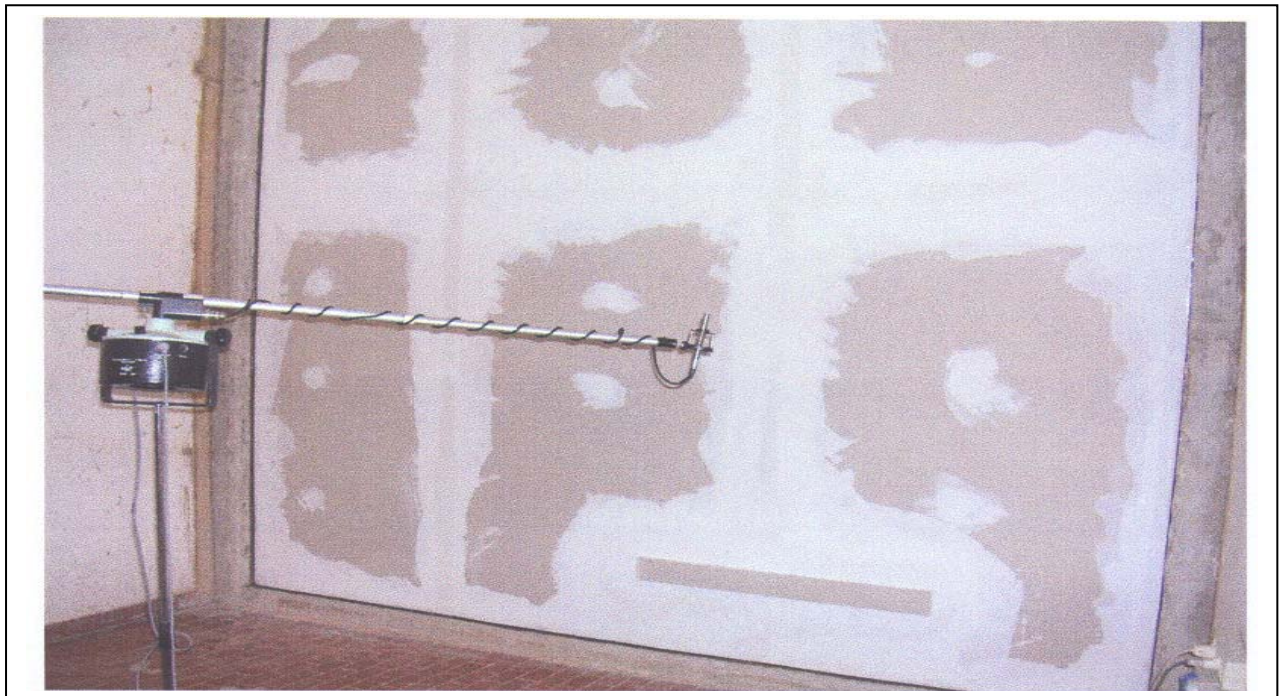


Fig. 9 Dividing wall completely sealed , sending room side

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Specimens tested

The following models have been tested :

- IGLOO A0551
- IGLOO A1001
- IGLOO COMPACT A1552
- IGLOO COMPACT A2032
- IGLOO COMPACT A2552
- IGLOO COMPACT A4052
- COMPACT PLUS A5003
- COMPACT PLUS A6003
- COMPACT PLUS A7003
- COMPACT PLUS A8003

The figures 10 and 11 show a specimen with sealing gasket driven down in closed position (wedge-shaped drive device plugged in) .

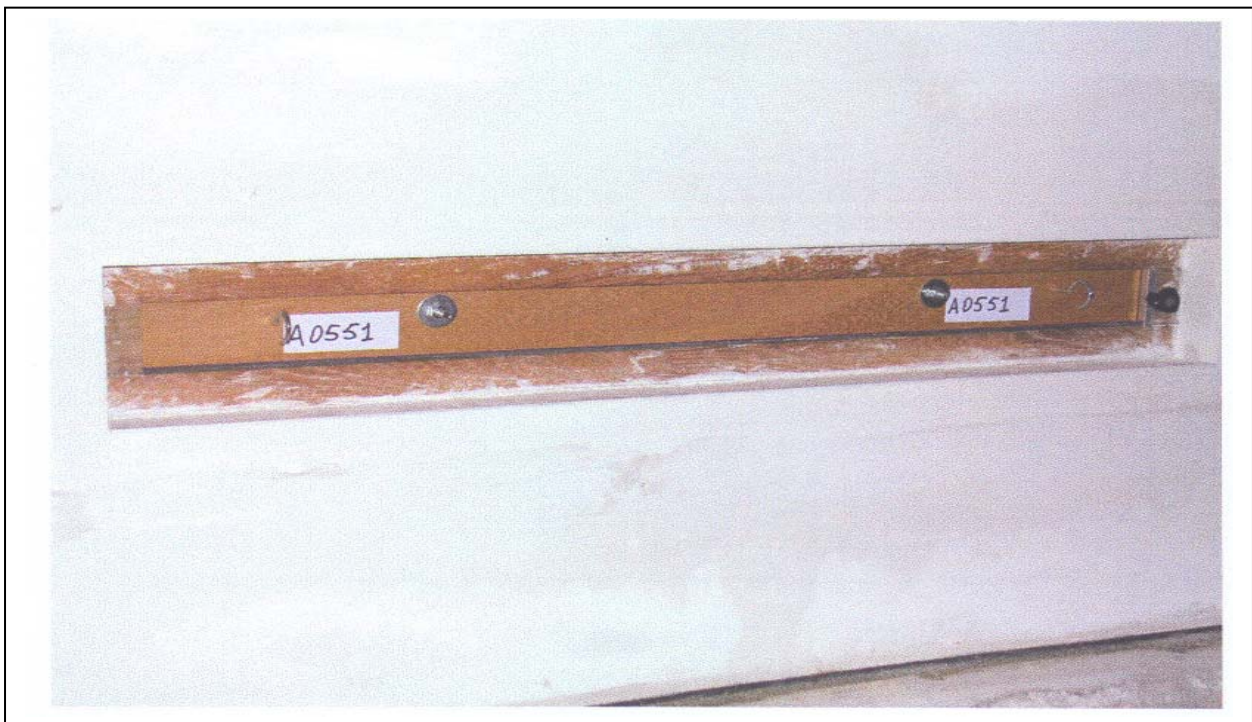


Fig. 10 - Specimen with sealing gasket driven down in closed position (observe on the right the wedge-shaped drive device plugged in) . Picture taken from the receiving side

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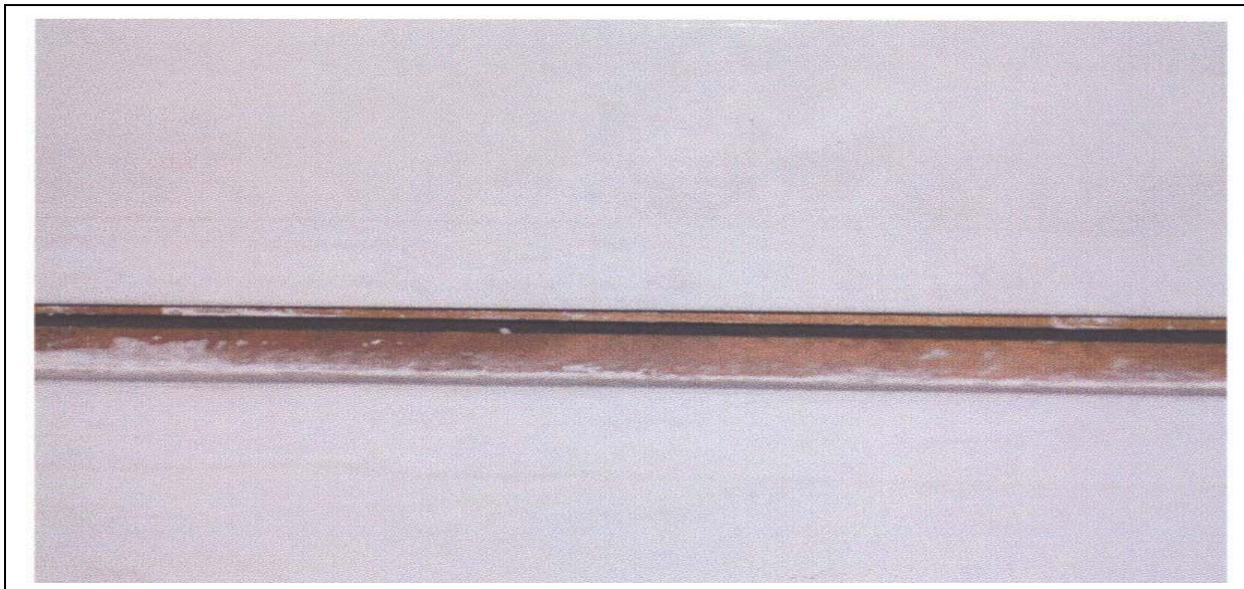


Fig 11 - Specimen with sealing gasket driven down in closed position .
Picture taken from the sending side

Drawings of all the models tested are shown in the following pages from page 10 to page 19 .

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Specimen IGLOO A0551

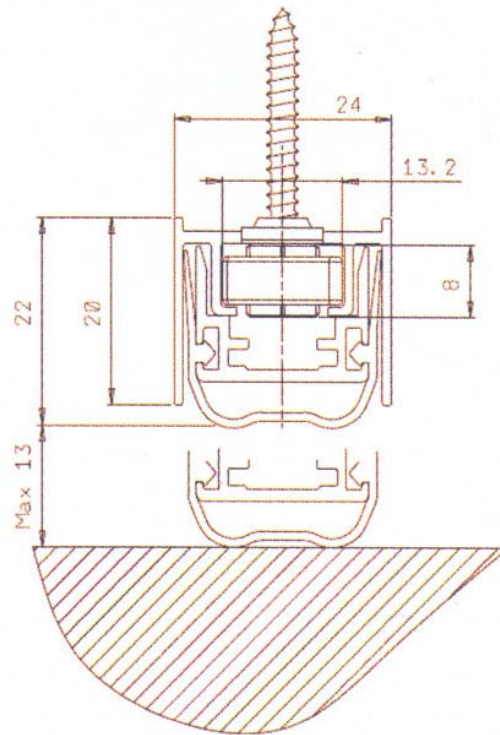
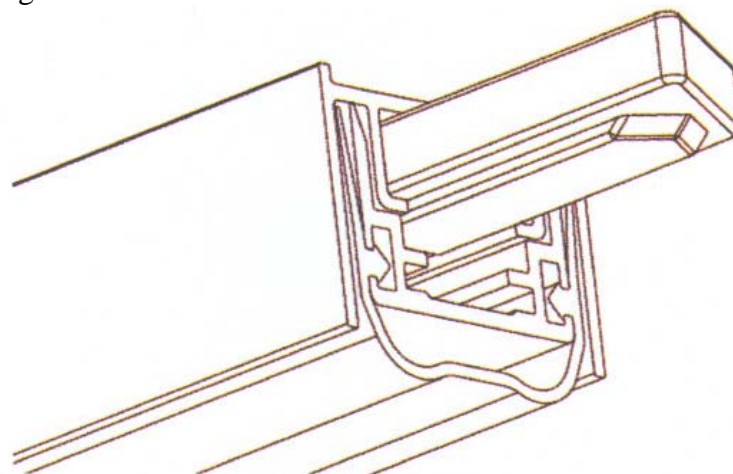


Fig. 12 IGLOO A0551 : vertical cross section



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Specimen IGLOO A1001

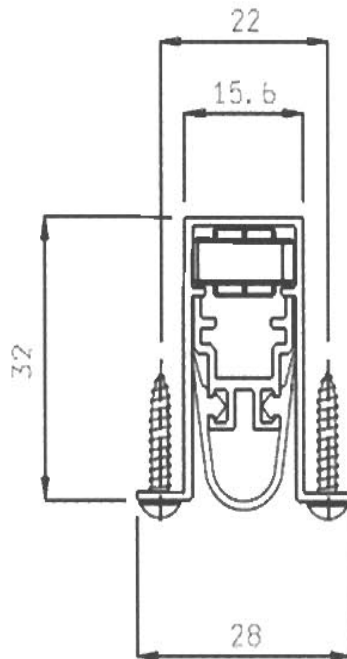
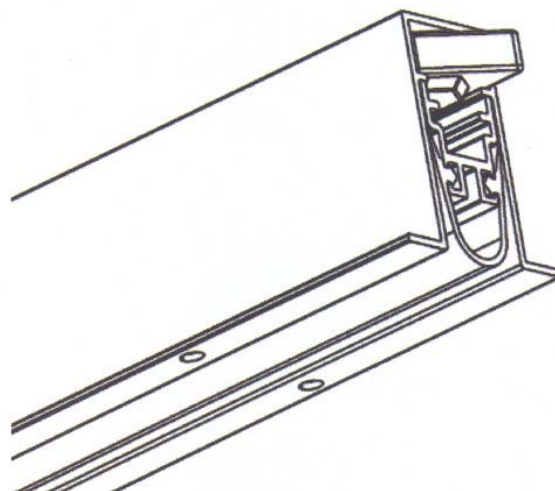


Fig. 14 IGLOO A1001 : vertical cross section



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Specimen IGLOO A1552

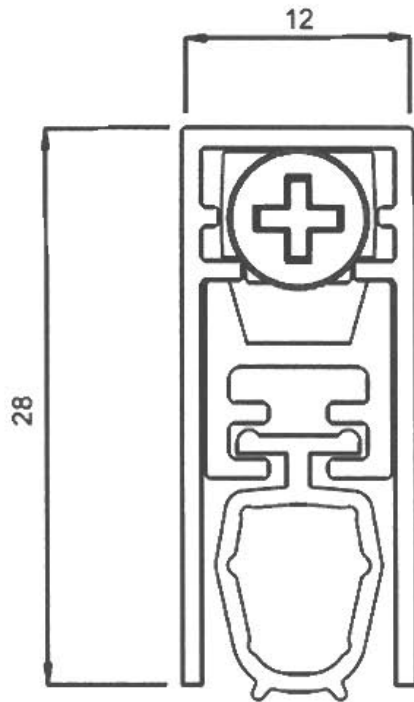
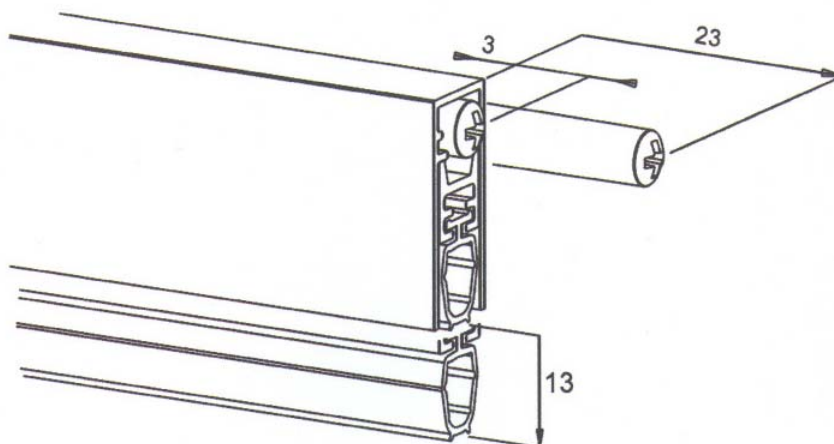


Fig. 16- IGLOO A1552: vertical cross section



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Specimen IGLOO COMPACT A2032

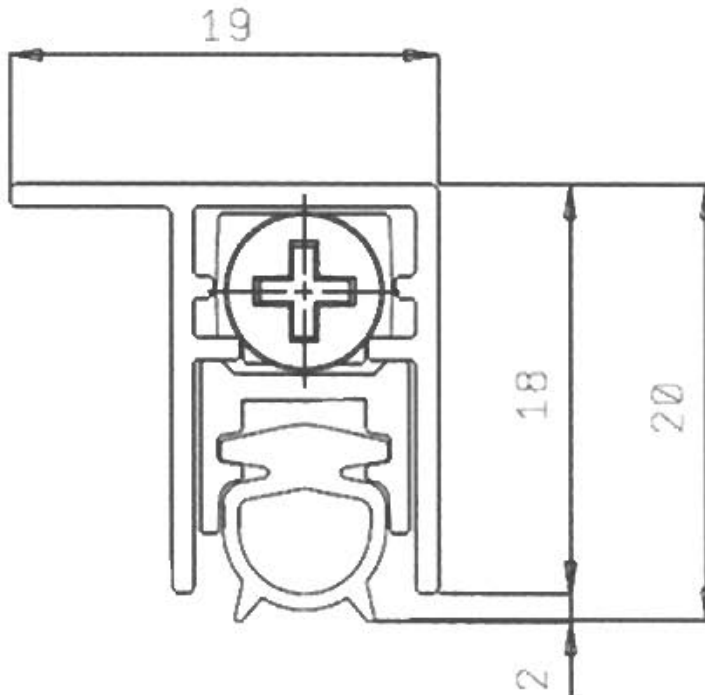
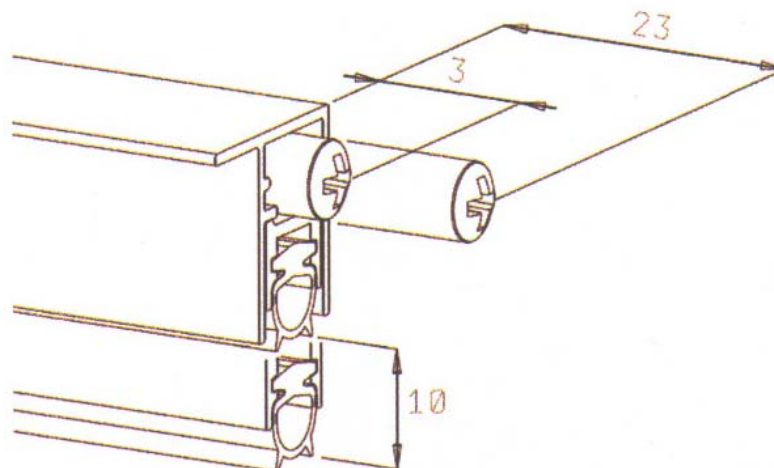


Fig. 18- IGLOO COMPACT A2032: vertical cross section



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Specimen IGLOO COMPACT A2552

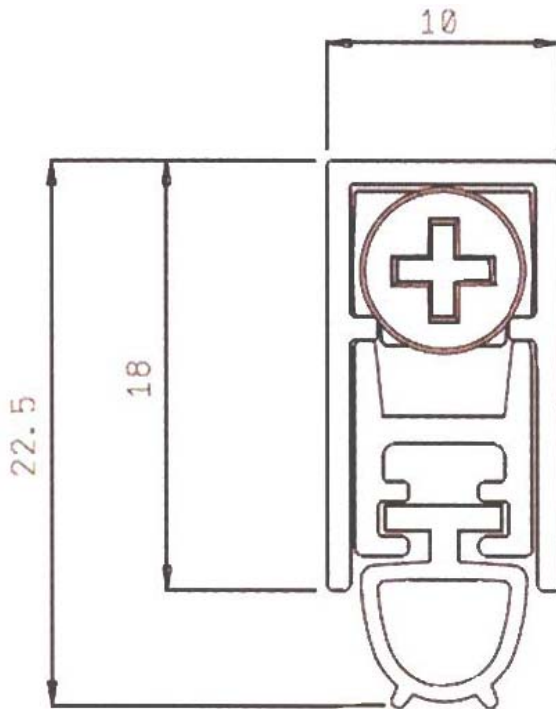
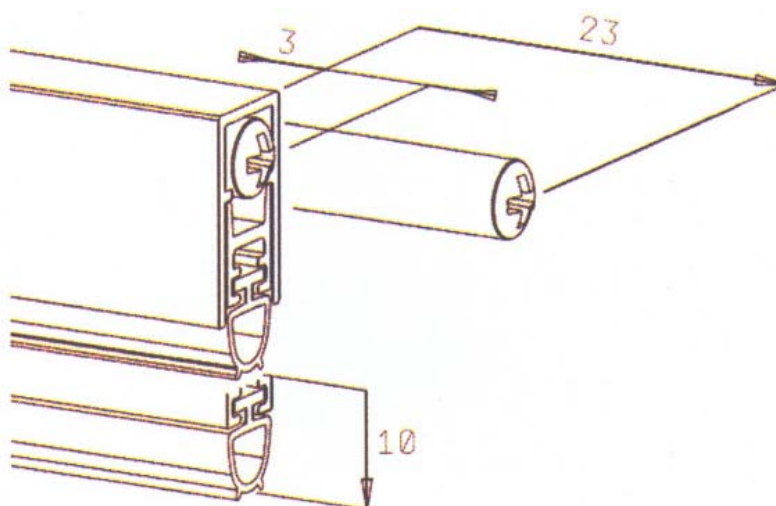


Fig. 20- IGLOO COMPACT A2552: vertical cross section



Test Report on Acoustic Behavior of “ Automatic door bottom seal “ elements

Specimen IGLOO COMPACT A4052

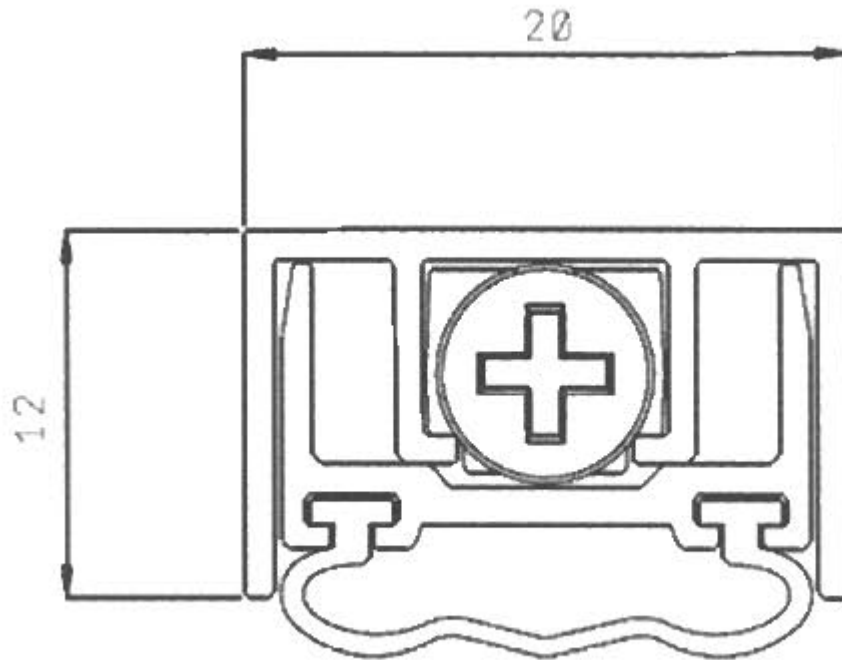
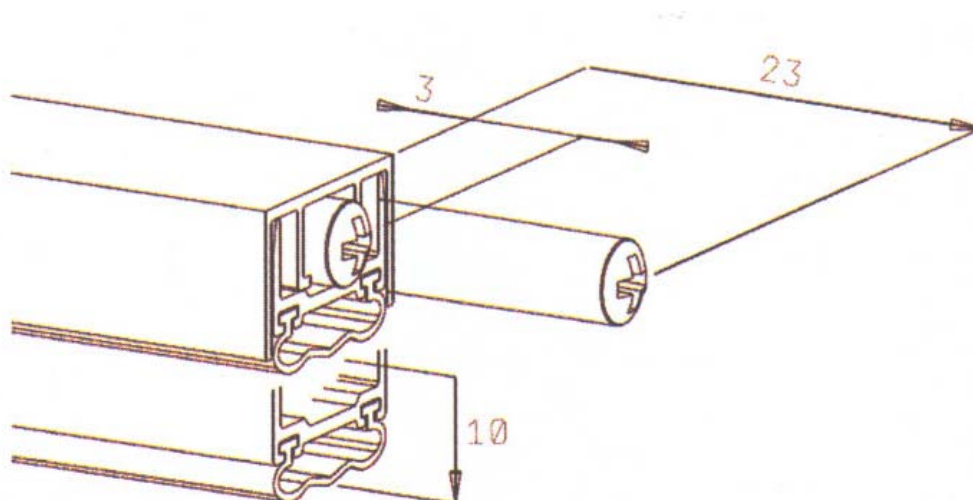


Fig. 22- IGLOO COMPACT A4052: vertical cross section



Test Report on Acoustic Behavior of “ Automatic door bottom seal “ elements

Specimen Compact Plus 5003

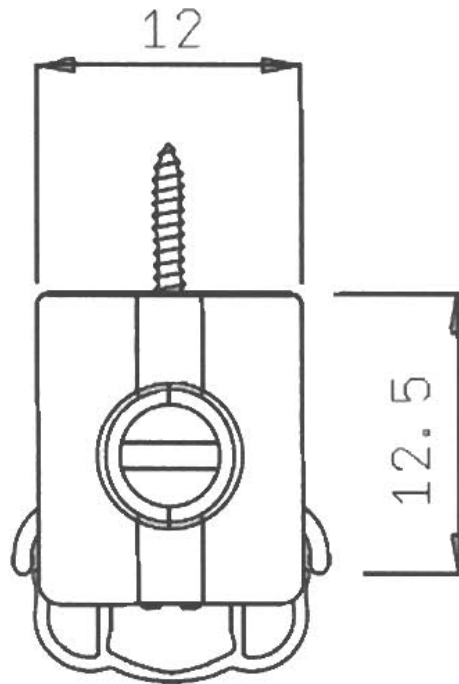
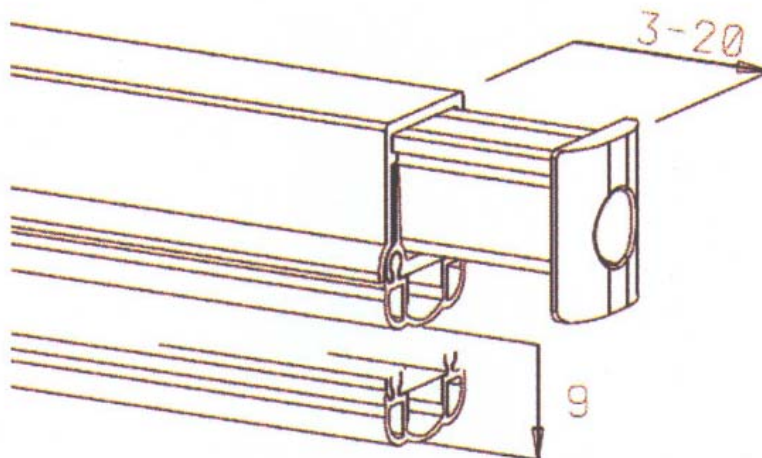


Fig. 24- Compact Plus 5003 : vertical cross section



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Specimen Compact Plus 6003

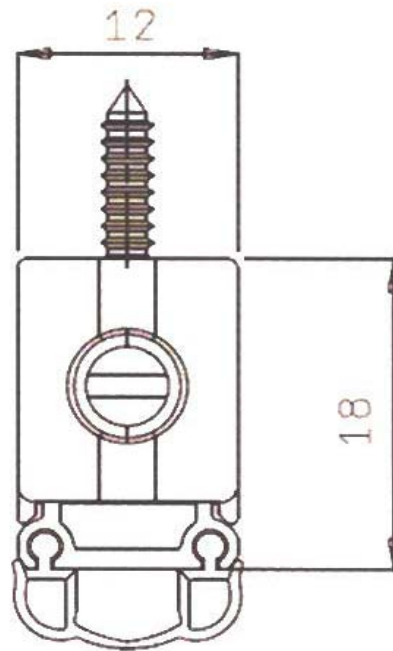
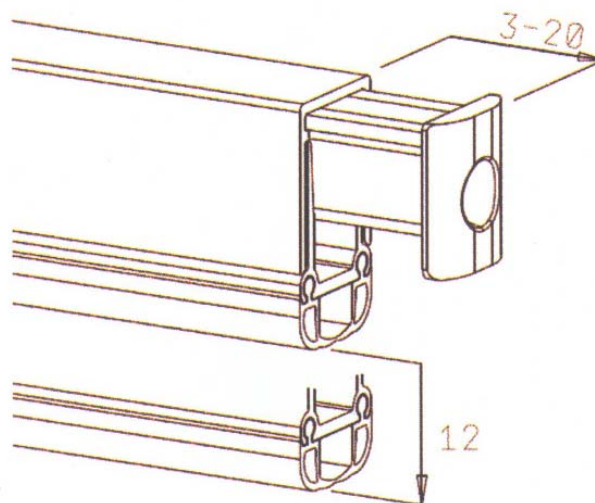


Fig. 26 - Compact Plus 6003 : vertical cross section



Test Report on Acoustic Behavior of “ Automatic door bottom seal “ elements

Specimen Compact Plus 7003

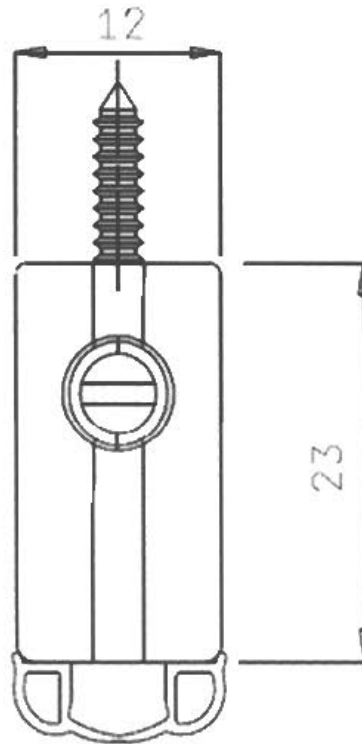
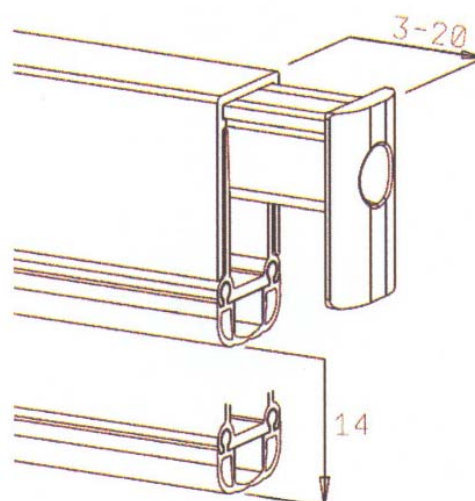


Fig. 28 - Compact Plus 7003 : vertical cross section



Test Report on Acoustic Behavior of “ Automatic door bottom seal “ elements

Specimen Compact Plus 8003

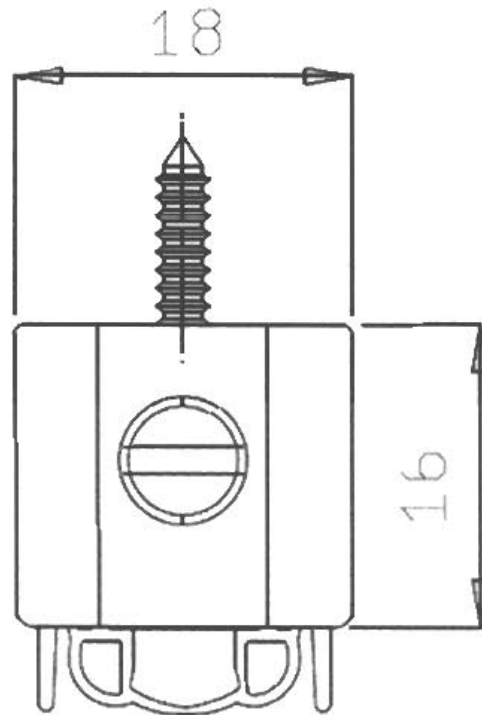
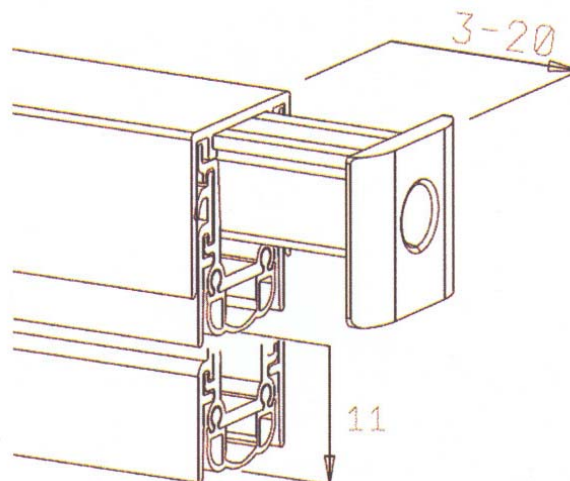


Fig. 30 - Compact Plus 8003 : vertical cross section



Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

4. TEST METHOD

The purpose of this work is to study the acoustic behaviour of ten different models of “ Automatic door bottom seal “ produced by Domatic , evaluating the acoustic insulation in respect to airborne noise .

The selected specimens have been tested at the test laboratories of ITC-CNR , Consiglio Nazionale Delle Ricerche , Istituto per le Tecnologie della Costruzione , in order to evaluate the acoustic insulation of small elements , ($D_{n,e}$) , according to the standards UNI EN ISO 20140 -10 and UNI EN ISO 717-1 .

- **Evaluation of the acoustic insulation**

Tests have been done according to the standard UNI EN ISO 20140 – 10 . This Standard set how to measure in a Lab the aerial acoustic insulation of small elements , parts of a building , ($D_{n,e}$) and applies to parts of a building , excluding doors and windows , having an area less than one square meter and various shapes , transmitting sounds trough two adjacent rooms , or trough one room and the outer space .

The Standard UNI EN ISO 20140 – 10 define the acoustic insulation of small elements as follows :

$$D_{n,e}=L1- L2+ 10\log(Ao/A) , \text{ dB}$$

With

L1 is the mean level of acoustic pressure into the sending room , in decibel

L2 is the mean level of acoustic pressure into the receiving room , in decibel

Ao is the reference surface area (for Lab. Tests Ao is 10 square meters)

A is the equivalent absorbing area of receiving room , square metes

- **Generating the sound field in the sending room**

The sound source is positioned in the sending room so as to produce a sound field as uniform as possible and at a distance from the specimen to be tested so that it is not predominant the sound radiation directed onto the specimen itself . The sound used is a “ white noise “

- **Measure of the mean level of acoustic pressure**

The method of the moving microphone with temporal space integration of the square value of the acoustic pressure is used . The moving microphone has been positioned according to the Standard UNI EN ISO 140 Parte 1a.

The acoustic pressure level is measured trough frequency filters spaced one third of octave , according to the following :

100	125	160	200	250	315	400	500	630	Hz
800	1000	1250	1600	2000	2500	3150	4000	5000	Hz

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The moving microphone is supported by a rod inclined so that the minimum distance from the floor is one meter and the maximum one is two meters .

Measurement and Evaluation of the “ sound absorption equivalent area “

The sound absorption equivalent area A , see formula (1) , is determined by the Sabine formula :

$$A = 0,16 V/T \quad \text{square meters} \quad 2)$$

With :

V is the receiving room volume , in cubic meters

T is the reverberation time of the receiving room , in seconds

The reverberation time is measured according to the Standard UNI EN 20354 .

Two different positions of the loudspeaker and three different positions of the microphone are used and two measurement are taken in each position .

Evaluation Index of the acoustic insulation of small elements

Applying the standard UNI EN ISO 717-1 , 1997 , a single figure is obtained to characterize totally the acoustic performance ; this figure is called Evaluation Index of the acoustic insulation of small elements , Dn.e.w ;

It represents the value at 500 Hz on the reference graph , as a result of the process of evaluation of the diagram of the measured Dn.e to frequency , into the range from 100 Hz to 3.150 Hz .

The evaluation process is done comparing the diagram of the measured Dn.e to frequency to reference diagram defined by the Standard UNI EN ISO 717 – 1 , looking for the better tuning between the two diagrams .

Once found the tuning , the figure of the Evaluation Index is the value (dB) on the reference diagram corresponding to the 500 Hz abscissa .

Considering the different spectra of various noise source the Standard UNI EN ISO 717-1 , 1997 , define the spectral correction factors , C and Ctr ; such factors are computed according to the cited Standard and shown together with the Evaluation Index as part of the total results .

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

INSTRUMENTS

- a) Sound Meter : real time integrating / measuring function .
This instruments works as a precision integrating Sound Meter , according to IEC 651 and IEC 804 class 1) , and also as a two channel frequency spectrum analyzer with octave and octave-third digital filters , according to IEC 225 and ANSI S1-11 ;
- b) Microphones supported on revolving rods .
Two microphones , capacitor type , 1/2” size , 50 mV/Pa sensitivity , with integrated pre-amplifier are supported by a rod of a length adjustable from 0,5 to 2 meters , turning at a time per turn that can be set at 16 , 32 , 64 seconds .
- c) Sound source
A single box contains a noise generator , a power amplifier , and a horn type loudspeaker : a continuous power of 118 dB in the range from 100 Hz to 4000 Hz can be generated .

TEST ROOMS

The dimensions of the rooms and test hole are as follows :

ROOM	Sending	Receiving
Volume (cubic meter)	50	60
Inner total surface (square meter)	79,5	91,5

TEST HOLE BETWEEN SENDING AND RECEIVIN ROOM

Height	Length	Width	surface
3,0 meters	3,31 meters	0,5 meter	9,93 square meters

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

TEST RESULTS

Specimen : Dividing wall completely shut

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 17.9 degree Celsius

Test room air dampness : 33.2 %

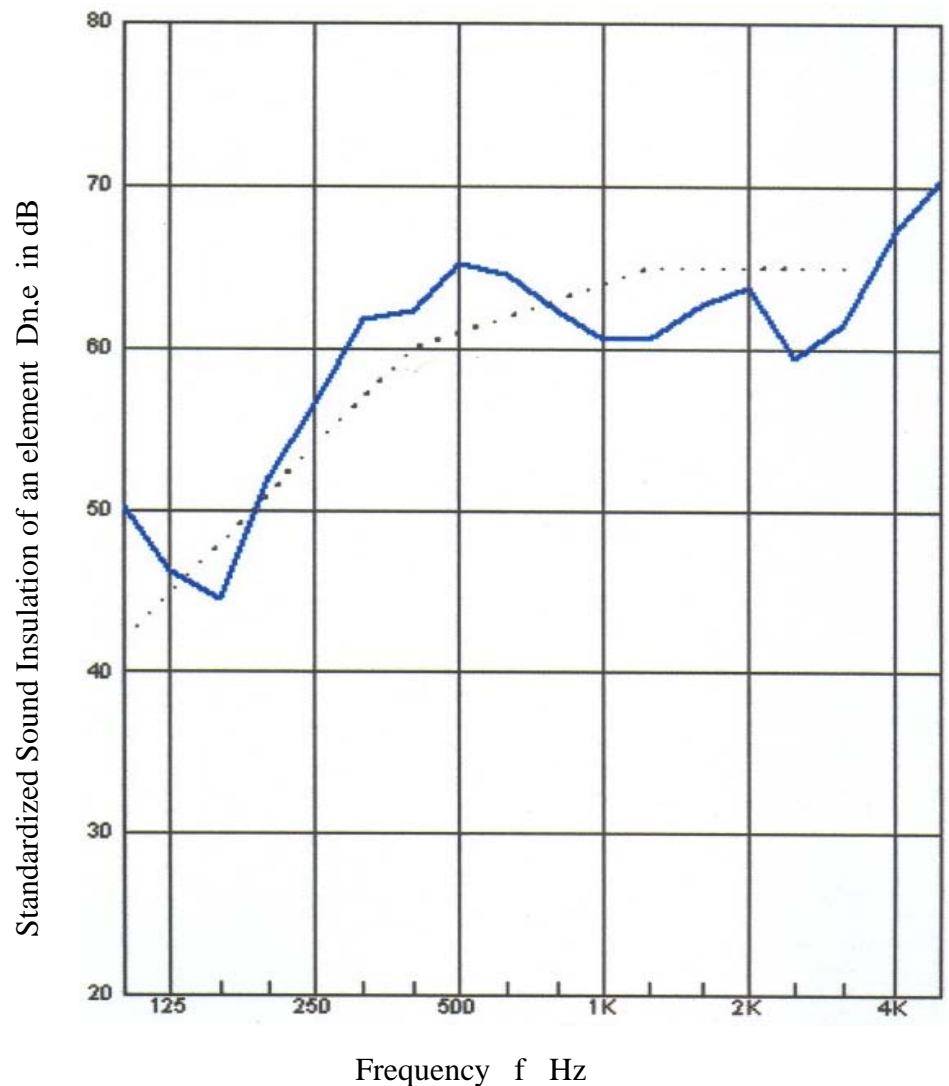
Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

one – third – octave

f	Dn,e
Hz	dB
100	50.2
125	46.3
160	44.5
200	52.1
250	56.6
315	61.8
400	62.3
500	65.2
630	64.6
800	62.4
1000	60.7
1250	60.7
1600	62.8
2000	63.8
2500	59.4
3150	61.6
4000	67.2
5000	70.4



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 61 \quad (-1 ; -3) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : Dividing wall with automatic door bottom opened

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.3 degree Celsius

Test room air dampness : 34.3 %

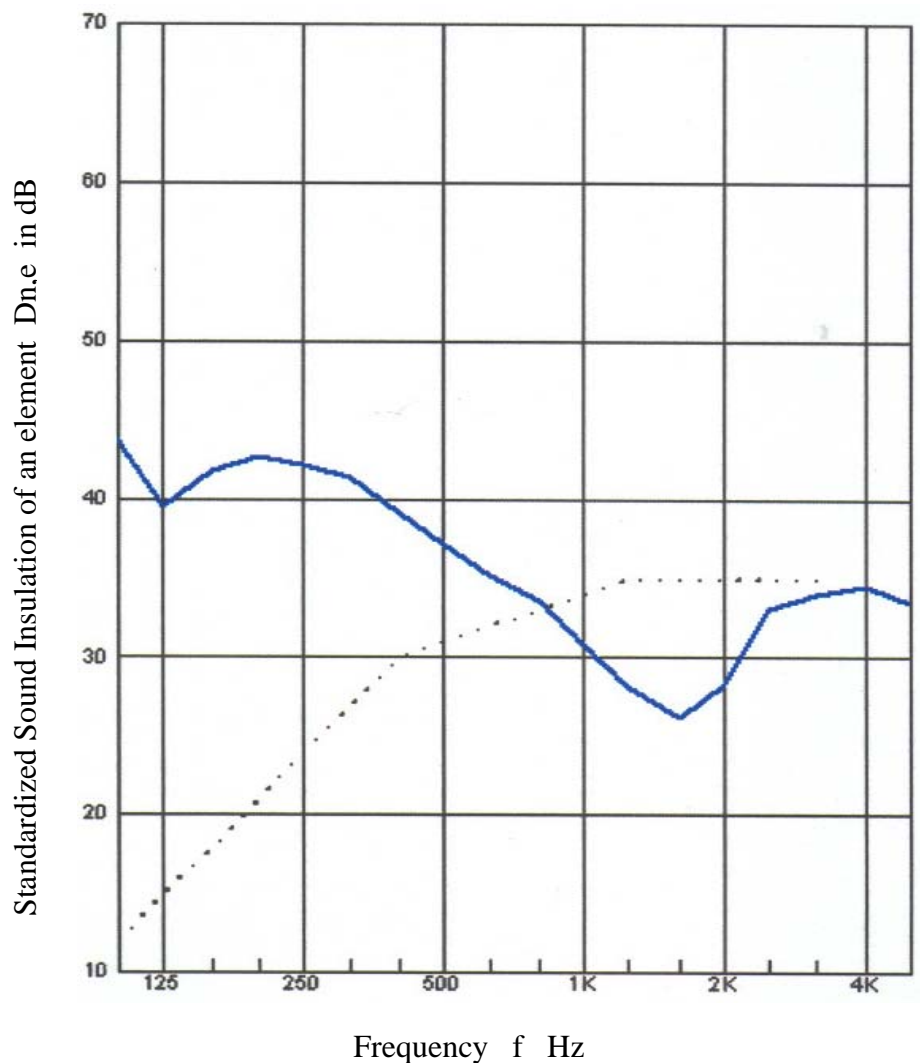
Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

one – third – octave

f	Dn,e
Hz	dB
100	43.6
125	39.5
160	41.8
200	42.7
250	42.2
315	41.4
400	39.1
500	37.2
630	35.2
800	33.6
1000	30.8
1250	28.2
1600	26.2
2000	28.3
2500	33.1
3150	34.0
4000	34.5
5000	33.5



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 31 \quad (-1 ; 0) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A0551

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.4 degree Celsius

Test room air dampness : 34.7 %

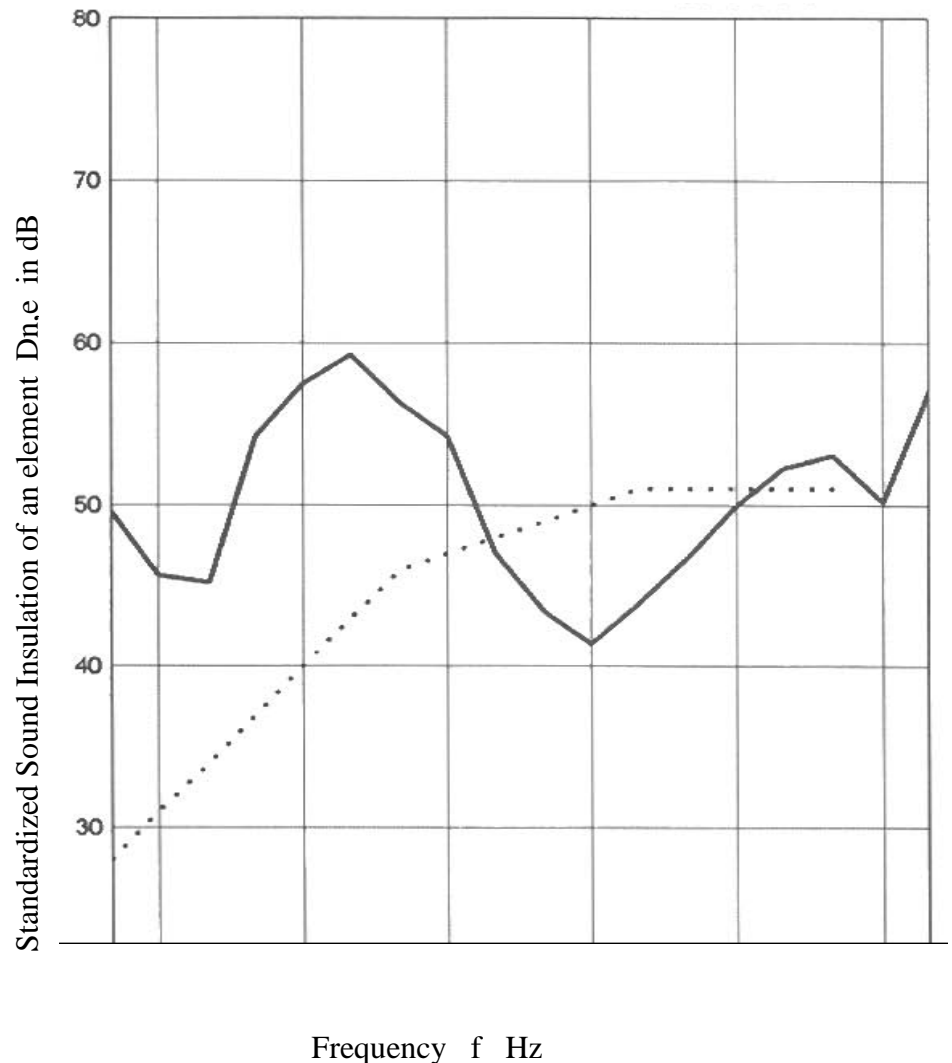
Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

one – third – octave

f	Dn,e
Hz	dB
100	49.6
125	45.7
160	45.2
200	54.3
250	57.5
315	59.3
400	56.3
500	54.3
630	47.1
800	43.4
1000	41.4
1250	43.9
1600	46.9
2000	50.0
2500	52.3
3150	53.1
4000	50.2
5000	57.2



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 47 \quad (-1 ; -2) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A1001

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.3 degree Celsius

Test room air dampness : 33.9 %

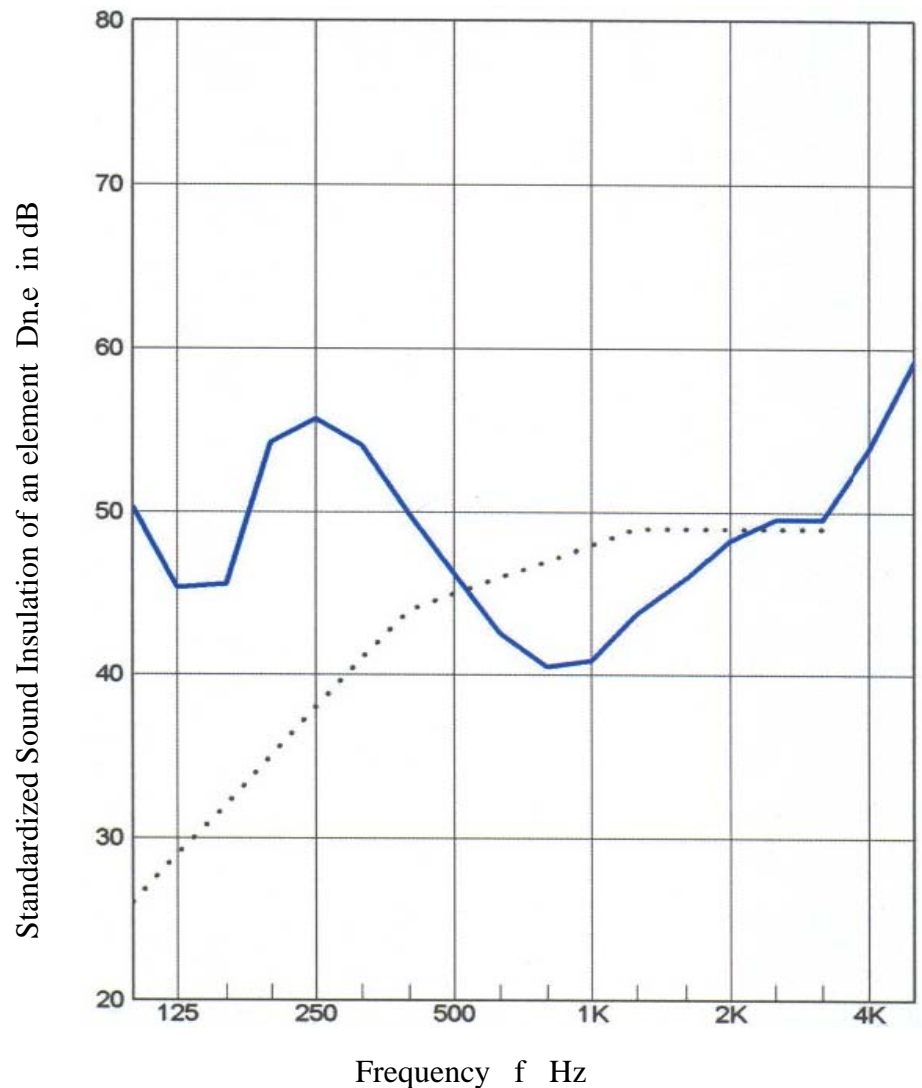
Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

one – third – octave

f	Dn,e
Hz	dB
100	50.3
125	45.4
160	45.6
200	54.3
250	55.7
315	54.1
400	49.9
500	46.3
630	42.6
800	40.5
1000	40.9
1250	43.8
1600	46.0
2000	48.3
2500	49.6
3150	49.6
4000	53.9
5000	59.3



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 45 \quad (0 ; -1) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A1552

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.4 degree Celsius

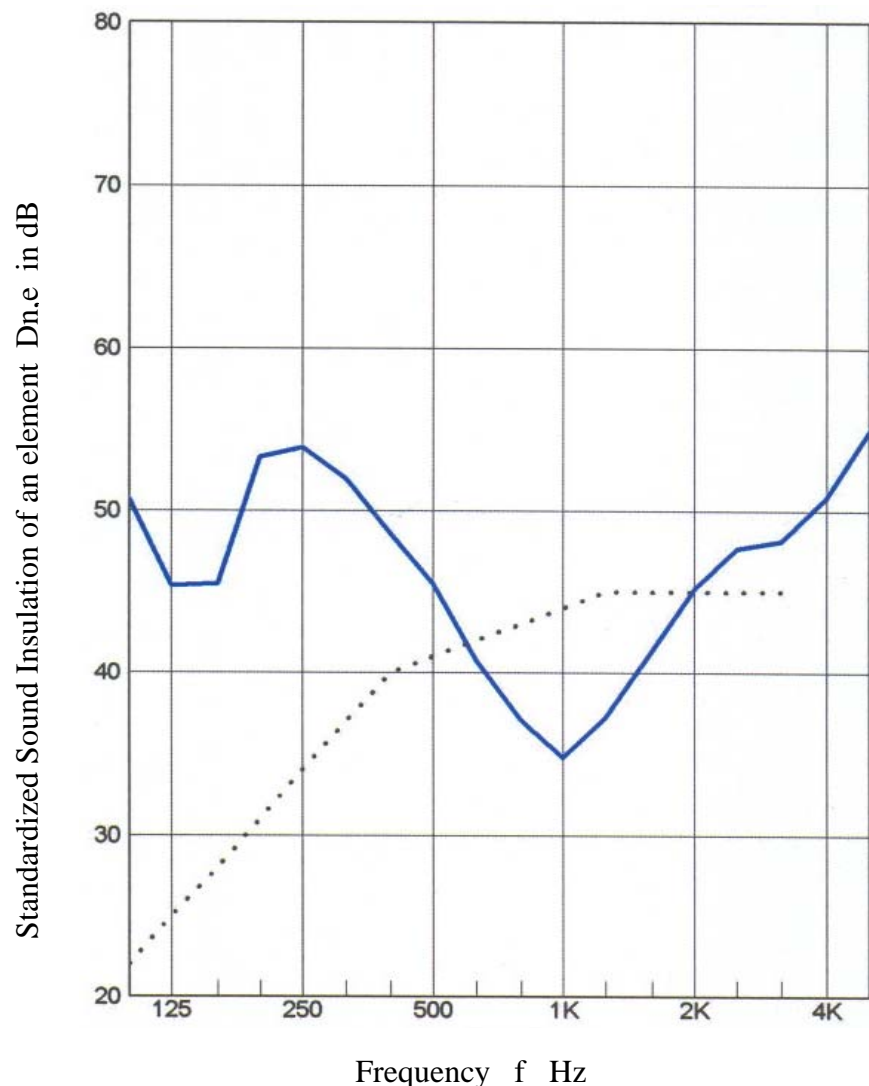
Test room air dampness : 34.5 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

f	Dn,e
Hz	dB
100	50.7
125	45.4
160	45.5
200	53.3
250	53.9
315	52.0
400	48.6
500	45.5
630	40.8
800	37.1
1000	34.8
1250	37.3
1600	41.4
2000	45.2
2500	47.7
3150	48.2
4000	50.9
5000	55.0



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 41 \quad (-1 ; -2) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A2032

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 17.9 degree Celsius

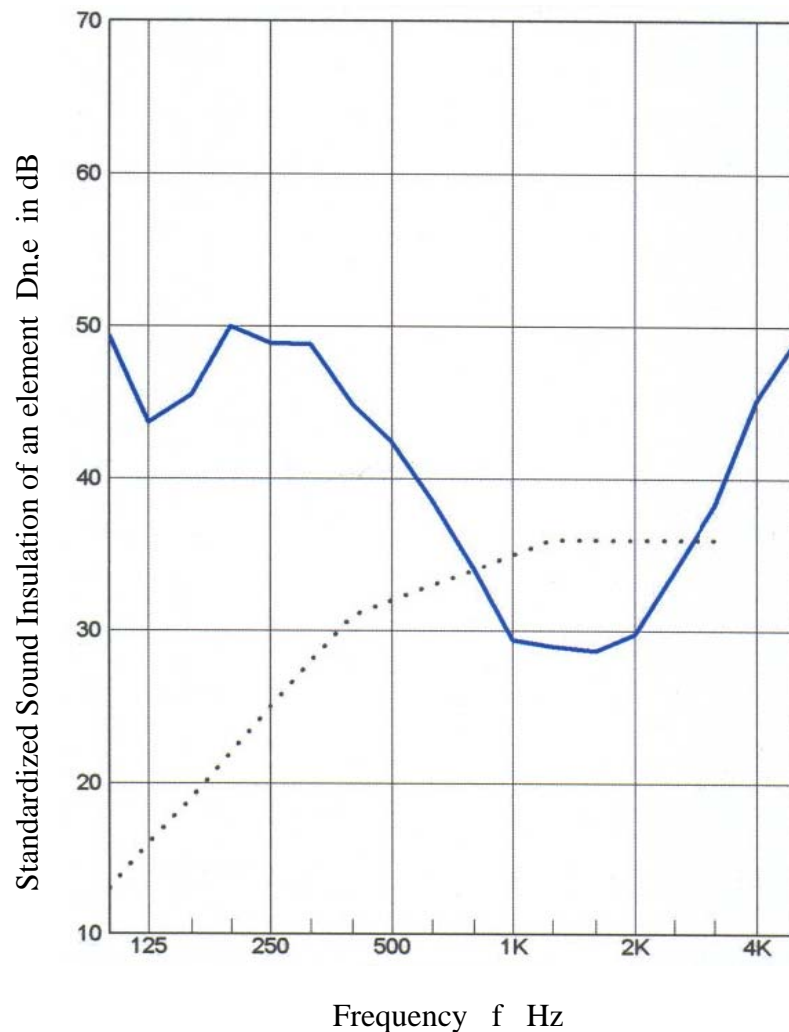
Test room air dampness : 32.1 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

f	Dn,e
Hz	dB
100	49.3
125	43.7
160	45.5
200	50.0
250	48.9
315	48.8
400	44.9
500	42.4
630	38.6
800	34.1
1000	29.4
1250	29.0
1600	28.7
2000	29.8
2500	33.9
3150	38.3
4000	45.2
5000	49.2



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 32 \quad (0; 0) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A2552

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

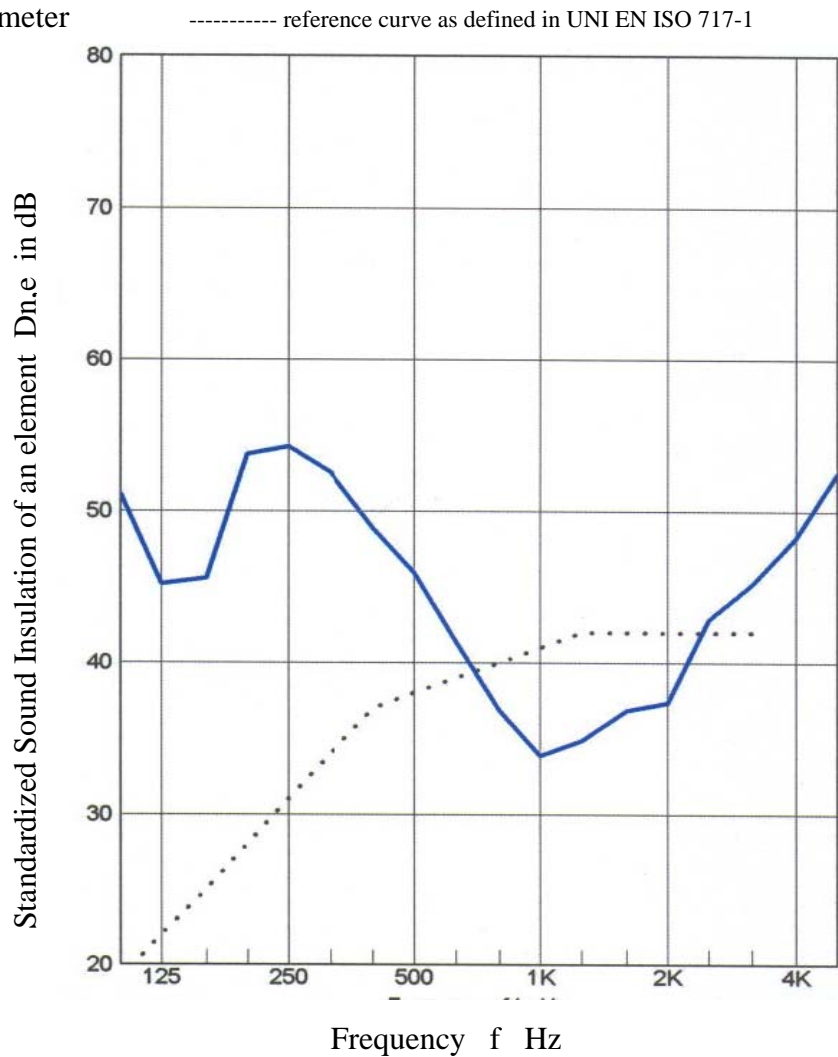
Test room air temperature : 17.7 degree Celsius

Test room air dampness : 32.3 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

f	Dn,e
Hz	dB
100	51.1
125	45.2
160	45.6
200	53.8
250	54.3
315	52.6
400	48.9
500	46.0
630	41.4
800	36.9
1000	33.9
1250	34.9
1600	36.9
2000	37.4
2500	42.9
3150	45.2
4000	48.3
5000	52.6



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 38 \quad (0 ; -1) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A4052

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.2 degree Celsius

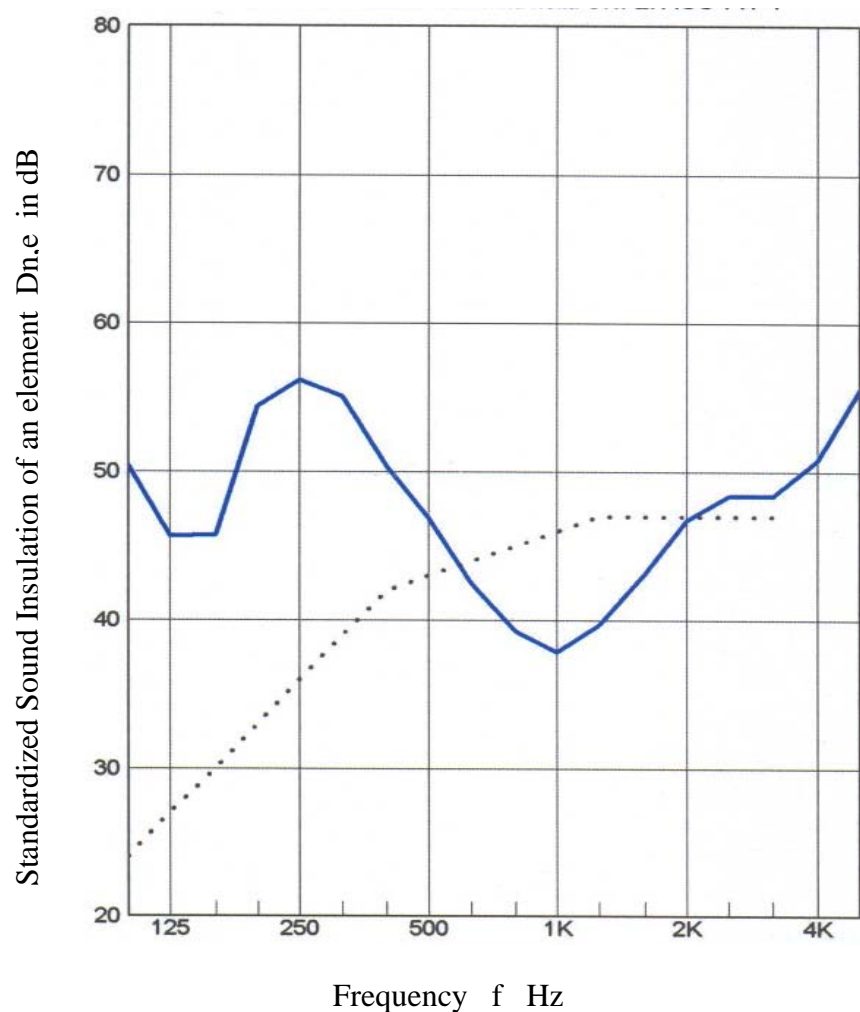
Test room air dampness : 34.5 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

f	Dn,e
Hz	dB
100	50.4
125	45.7
160	45.8
200	54.4
250	56.2
315	55.1
400	50.4
500	46.9
630	42.5
800	39.3
1000	37.9
1250	39.7
1600	43.2
2000	46.8
2500	48.4
3150	48.4
4000	50.8
5000	55.6



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 43 \quad (-1 ; -1) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A5003

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.2 degree Celsius

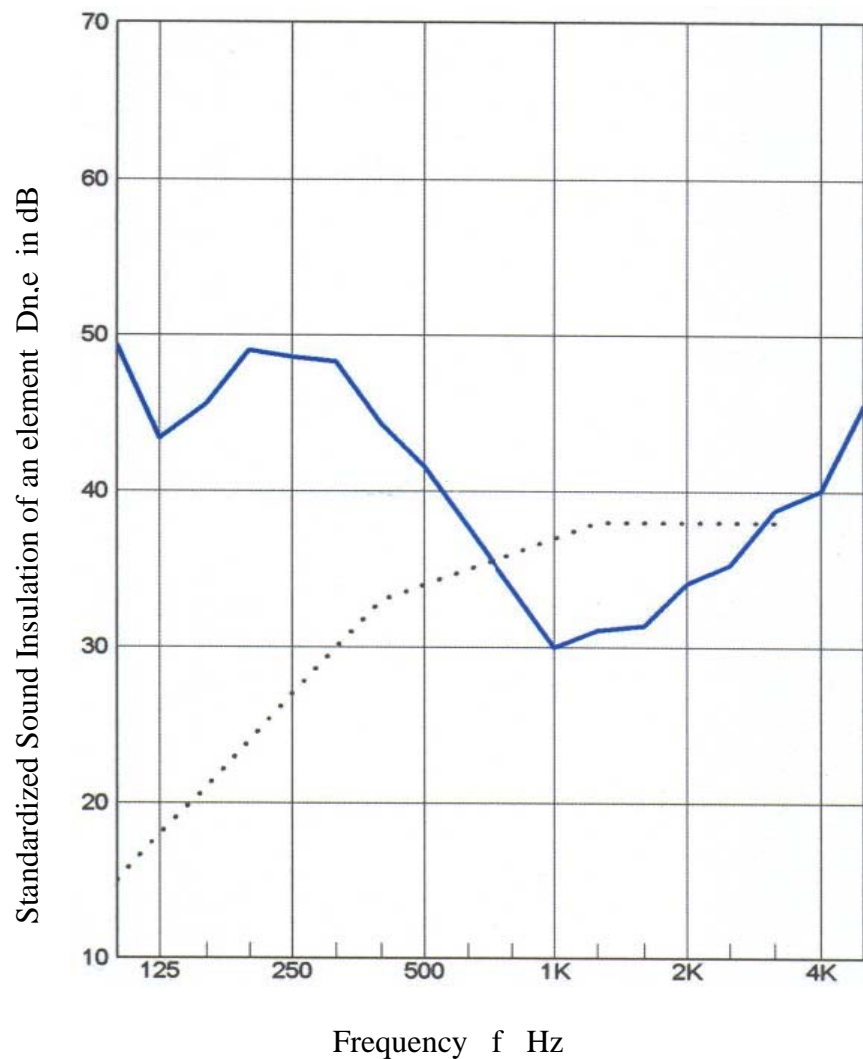
Test room air dampness : 34.6 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

f	Dn,e
Hz	dB
100	49.3
125	43.4
160	45.6
200	49.0
250	48.6
315	48.3
400	44.3
500	41.6
630	37.8
800	33.8
1000	30.0
1250	31.1
1600	31.4
2000	34.1
2500	35.3
3150	38.8
4000	40.1
5000	45.6



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 34 \quad (0 ; -1) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A6003

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.3 degree Celsius

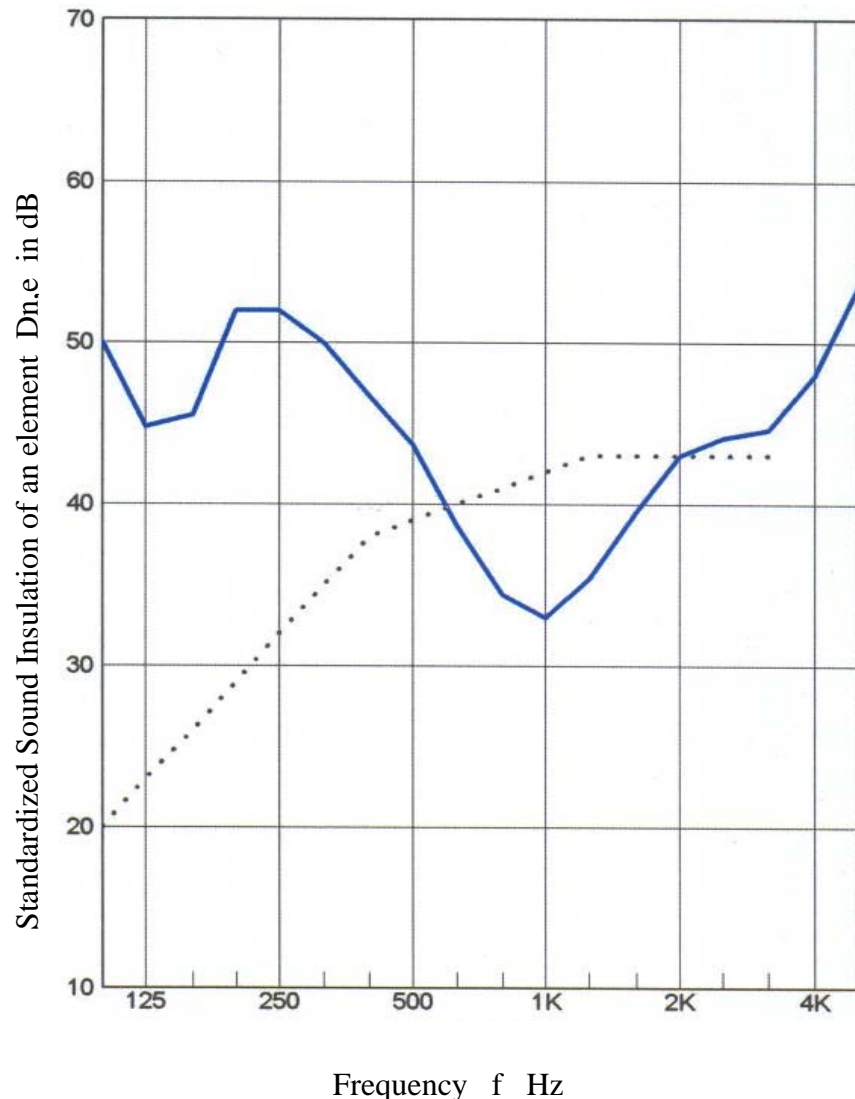
Test room air dampness : 34.3 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

f	Dn,e
Hz	dB
100	50.0
125	44.8
160	45.5
200	52.0
250	52.0
315	50.0
400	46.7
500	43.7
630	38.7
800	34.4
1000	33.0
1250	35.4
1600	39.6
2000	43.0
2500	44.1
3150	44.6
4000	48.0
5000	53.6



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 39 \quad (-1 ; -2) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A7003

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

Test room air temperature : 18.1 degree Celsius

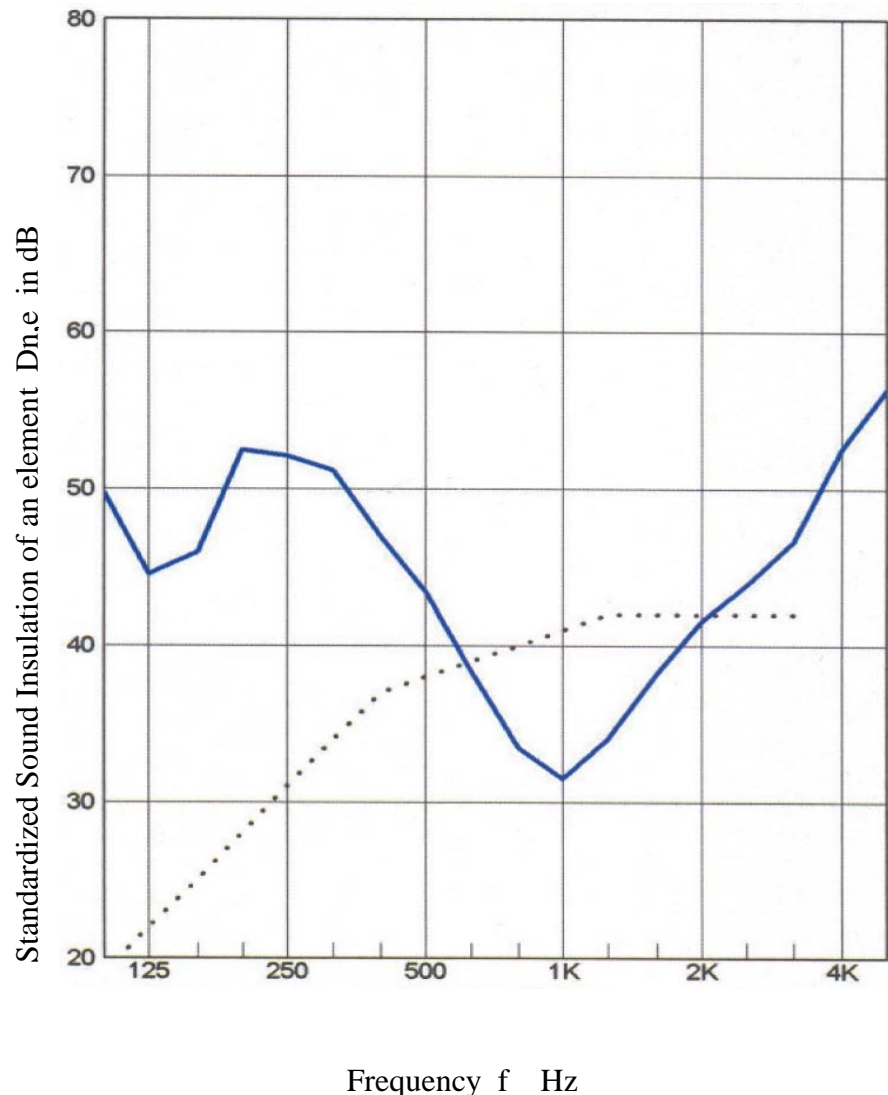
Test room air dampness : 34.3 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

----- reference curve as defined in UNI EN ISO 717-1

f	Dn,e
Hz	dB
100	49.7
125	44.6
160	46.0
200	52.5
250	52.1
315	51.2
400	47.0
500	43.5
630	38.4
800	33.5
1000	31.5
1250	34.1
1600	38.3
2000	41.6
2500	43.9
3150	46.7
4000	52.6
5000	56.4



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 38 \quad (-1 ; -2) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method

Test Report on Acoustic Behaviour of “ Automatic door bottom seal “ elements

Specimen : A8003

Sound insulation of building elements according to Standard UNI EN 20140-10 (1993)

Sound insulation Index according to Standard UNI EN ISO 717-1 (1992)

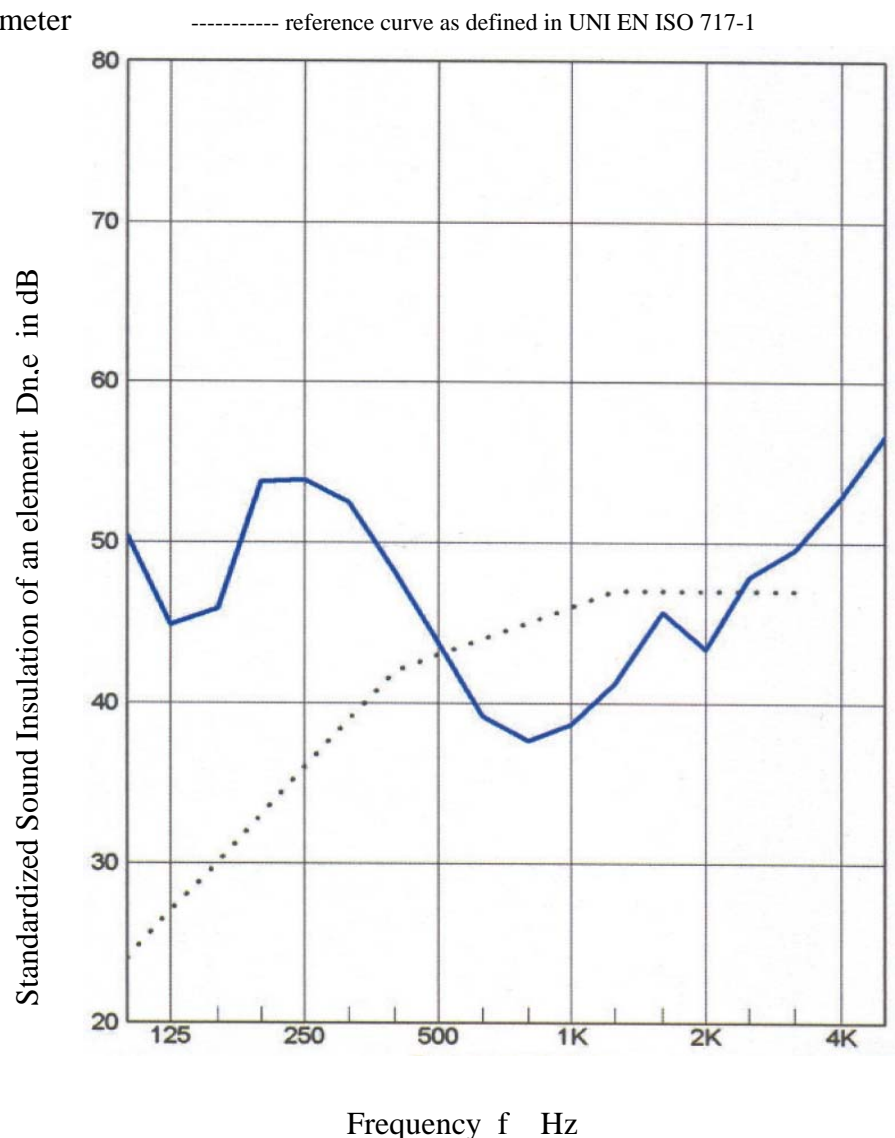
Test room air temperature : 17.6 degree Celsius

Test room air dampness : 341.7 %

Sending room volume : 50 cubic meter

Receiving room volume : 60 cubic meter

f	Dn,e
Hz	dB
100	50.4
125	44.9
160	45.9
200	53.8
250	53.9
315	52.5
400	48.2
500	43.8
630	39.2
800	37.7
1000	38.7
1250	41.3
1600	45.7
2000	43.4
2500	47.9
3150	49.6
4000	52.9
5000	56.7



Index according to UNI EN ISO 717-1 :

$$D_{n,e,w} (C; C_{tr}) = 43 \quad (-1 ; -2) \text{ dB}$$

Evaluation based on results measured using a laboratory technical method