DELTA Test Report

TEST Reg. no. 100

Laboratory Measurement of Airborne Sound Insulation of a HansenProfile Tilt/Turn window with Lower Fixed Frame both with a 10-16-6 mm Insulating Glass Unit

Performed for HansenProfile

AV 165/08
DANAK 2629
Project no.: A580888
Page 1 of 9 incl.
1 graph sheet
6 annexes

17 June 2008

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Title
Laboratory Measurement of Airborne Sound Insulation of a HansenProfile Tilt/Turn window with Lower Fixed Frame both with a 10-16-6 mm Insulating Glass Unit

Journal no.	Project no.	Our ref.	Date of test
DANAK 2629	A580888	LSS/HSO/ilk	21 April 2008

Client
HansenProfile
Jernbanegade 26
6940 Lem
Denmark

Client ref.
Ole Nørholm

Test conditions

Laboratory:	EN ISO 140-1:1997
Measuring method:	EN ISO 140-3:1995
Evaluation:	EN ISO 717-1:1996, EN ISO 717-1 Amendment 1:2006

Results
Airborne sound insulation measured in the laboratory, weighted sound reduction index according to EN ISO 717-1:1996, EN ISO 717-1 Amendment 1:2006:

$$R_w\ (C;\ C_{tr}) = 37\ (-1;\ -5)\ dB$$

Graph Sheet no. 1 shows the sound reduction index of every one-third octave band together with the shifted reference curve corresponding to the measured weighted sound reduction index.

Remarks

Description of the test specimen:	See Annex 1-3
Mounting in the laboratory:	See Annex 1
Measuring conditions and procedure:	See Annex 4
Measurements at low frequencies:	See Annex 5
Measuring equipment:	See Annex 6

The test result applies to the tested specimen only.

Them, 17 June 2008
DELTA

Henrik S. Olesen
Senior Specialist, Acoustics

TEST Reg. no. 100

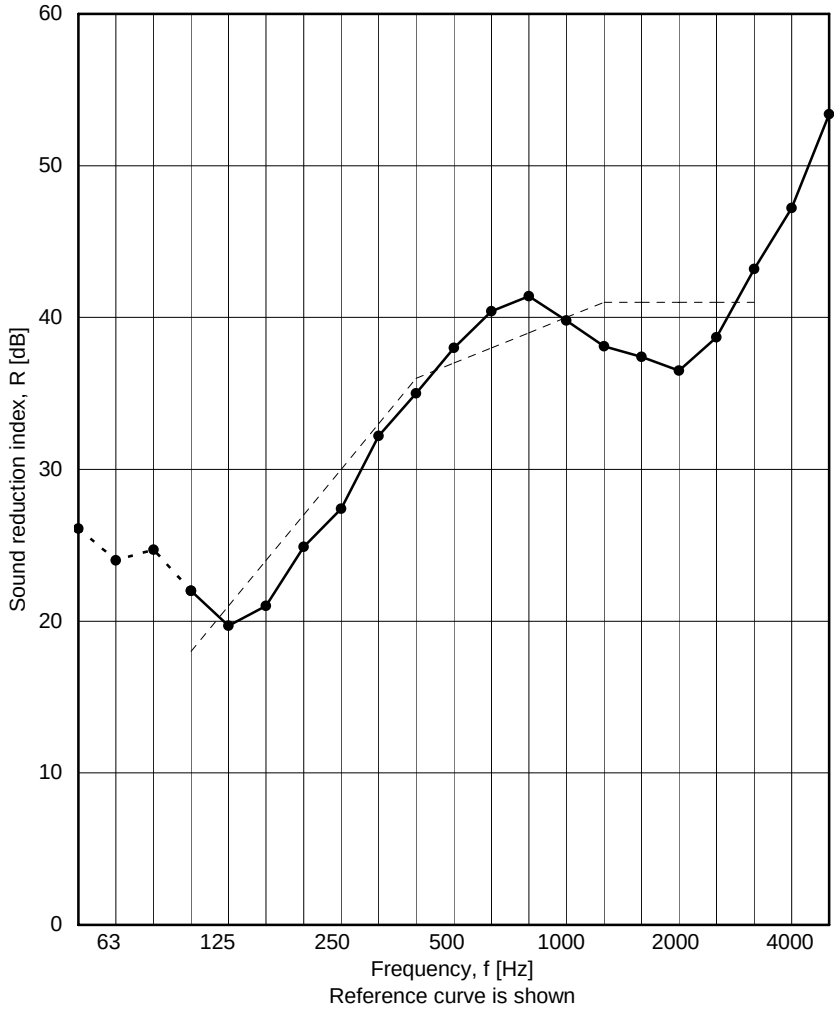
Laboratory measurement of sound reduction index according to EN ISO 140-3:1995

Client: HansenProfile, Jernbanegade 26, 6940 Lem, Denmark
Date of test: 21 April 2008

Description of the test specimen: HansenProfile Tilt/Turn window with Lower Fixed Frame both with a 10-16-6 mm Insulating Glass Unit
Description of the test specimen and mounting in the laboratory appear in Annex 1-3.
Test specimen mounted by: The client

Area of test opening: 2.65 m^2
Mass per unit area: 45 kg/m^2
Air temperature: 19 ºC
Air humidity: 46 % RH
Source room volume: 117.7 m^3
Receiving room volume: 64.8 m^3

Frequency f [Hz]	R One-third octave [dB]	R Octave [dB]
50*)	26.1	24.8
63*)	24.0	
80*)	24.7	
100	22.0	20.8
125	19.7	
160	21.0	
200	24.9	27.2
250	27.4	
315	32.2	
400	35.0	37.2
500	38.0	
630	40.4	
800	41.4	39.6
1000	39.8	
1250	38.1	
1600	37.4	37.4
2000	36.5	
2500	38.7	
3150	43.2	46.2
4000	47.2	
5000	53.4	



*) See Annex 5

Weighted sound reduction index according to EN ISO 717-1:1996 and EN ISO 717-1 Amendment 1:2006:

$R_w (C; C_{tr}) = 37 (-1; -5)$ dB

Evaluation based on laboratory measurement results obtained by an engineering method.

DELTA, 17 June 2008

Henrik S. Olesen, Acoustics

Description of the Test Specimen

Double glazed window consisting of two glazed sections, where the upper section opens inward as Tilt/Turn.

The element is made from thermally broken aluminum profile's from the
Hansen Millennium™ system (81.7 mm).

The lower section is a double glazed unit fixed to the frame with standard glazing beads.

The upper section is a Tilt/turn vent, complete with standard concealed operating mechanisms of the fabricate "Winkhaus" and non locking handle on the vent centre.
The D.G. unit is bonded to the vent.

Both 32 mm vision D.G. units comprise of:
Outer leaf
10 mm thick clear float glass toughened and heat soak tested to PrEN 14179.

Cavity
16 mm air filled with silver spacer bar.
Inner leaf
6 mm thick clear float glass toughened and heat soak tested to PrEN 14179.
Iplus E coating on surface 3.

The text above and further details shown in Annexes 2 and 3 were prepared by the client. The drawings have been reduced in size by DELTA and are not in scale.

Mounting in the Laboratory

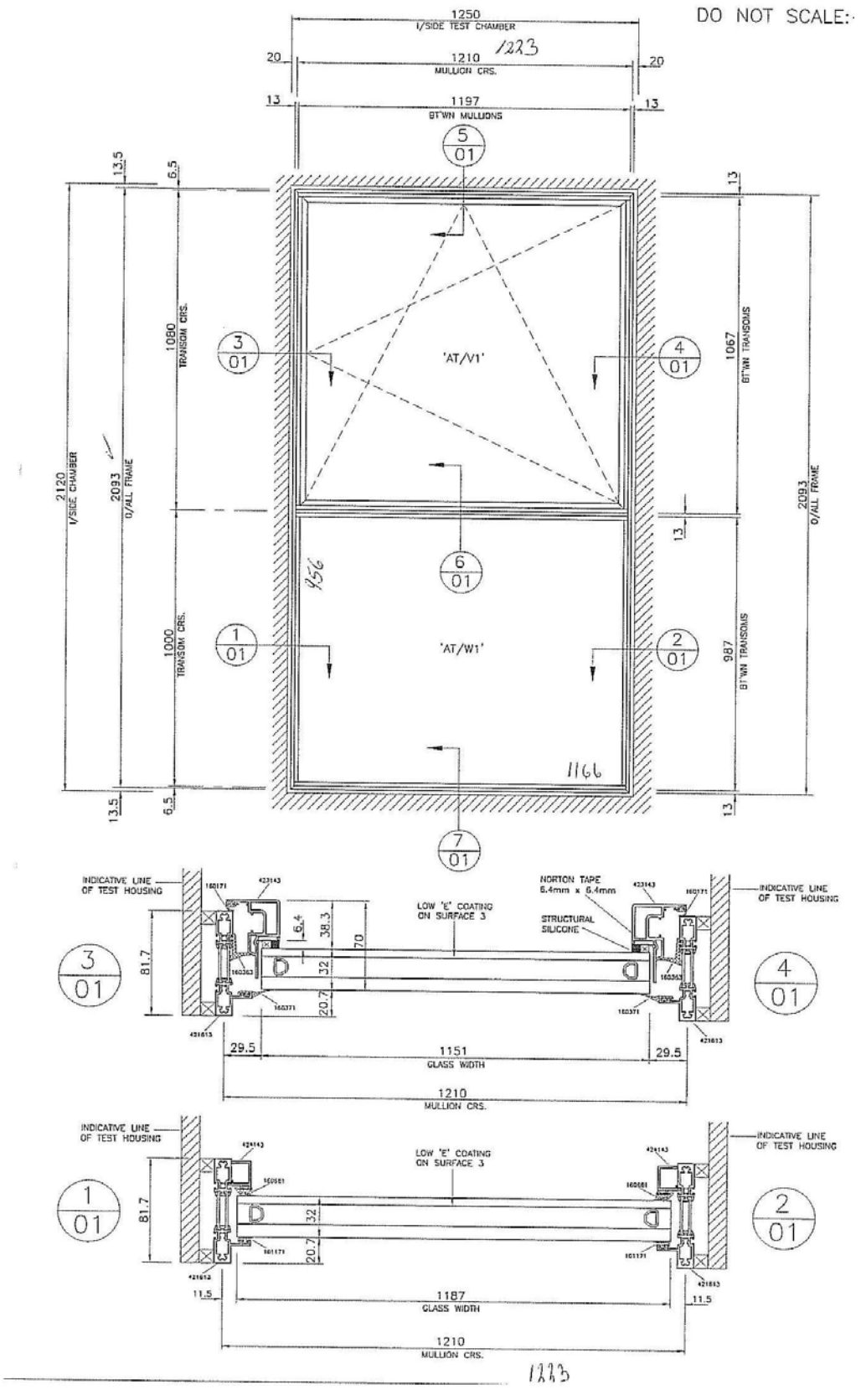
The dimensions of the test opening were 1250 mm × 2120 mm seen from the source room side, and 1370 mm × 2180 mm seen from the receiving room side.

The test specimen was mounted in the test opening with three screws in each vertical side of the frame, and the joint between the frame and the test opening was filled with mineral wool. From both sides a foam strip was fitted, and the joint was sealed with silicone joint filler.

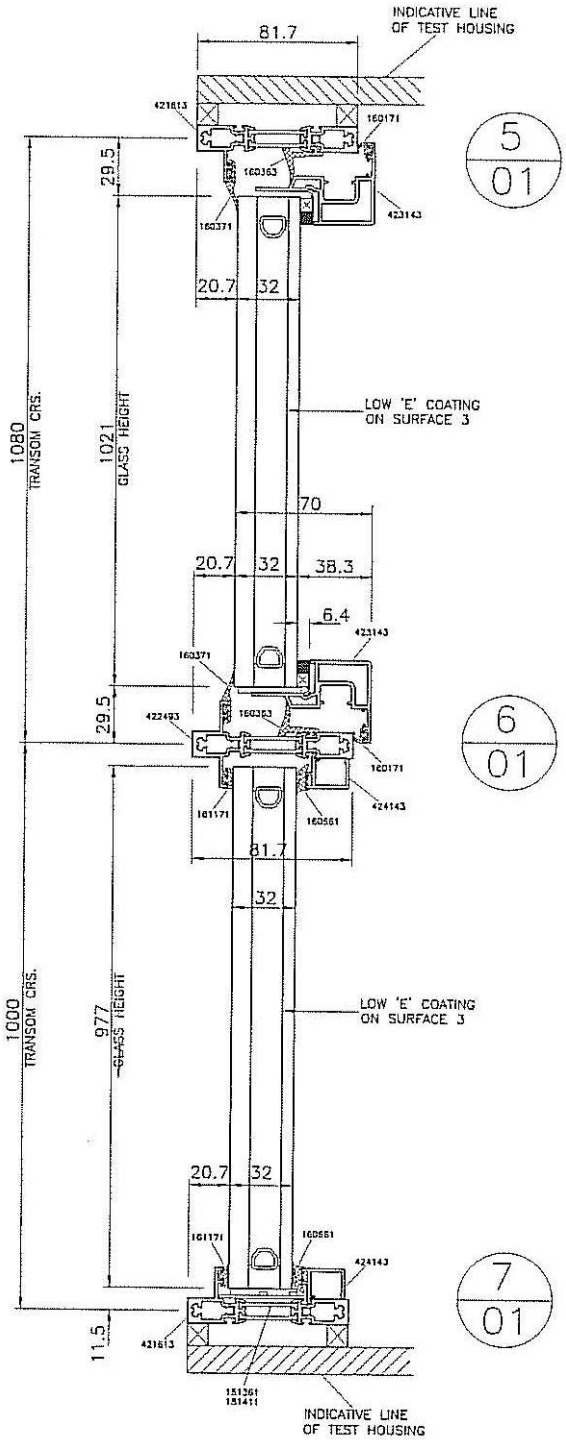
The niche depth from the surface of the window (the pane) against the source room was approx. 140 mm.

The mounting was carried out by the client.

NOTE: The drawing has been reduced in size by DELTA and is not in scale.



NOTE: The drawing has been reduced in size by DELTA and is not in scale.



Measuring Conditions and Test Procedure in the Frequency Range 100-5000 Hz

Source room:	Volume = 117.7 m^3 7 diffusing elements, 1.0 m × 1.2 m Reverberation time ≤ 1.4 s
Receiving room:	Volume = 64.8 m^3 5 diffusing elements, 1.0 m × 1.2 m Reverberation time ≤ 2.0 s
Test opening:	1.25 m × 1.50 m (source room side) 1.37 m × 1.56 m (receiving room side)
Depth of test opening:	0.45 m
Total partition wall area:	16.2 m^2
Loudspeaker system:	Dodecahedron loudspeaker moving along a traverse for measurements of sound pressure levels. Cycle time approx. 128 s. Open loudspeaker in one position for measurement of reverberation time.
Microphone system:	Rotating (32 s/rotation). Integration time: 256 s for measurements of sound pressure levels. The reverberation time is measured in 20 microphone positions distributed on the microphone path.
Sound signal:	Wideband pink noise
Filters:	One-third octave band filters with centre frequencies within the frequency range 100-5000 Hz

The sound reduction indices in Graph Sheet no. 1 have been corrected for sound transmission around the test specimen (flanking transmission). The correction value must not exceed 1.3 dB corresponding to a transmission ratio of 1:3. The calculated correction value was less than 1.3 dB for every one-third octave band.

In Annex 6 the maximum obtainable sound reduction index, R'_{max}, that can be measured in the laboratory is listed together with the corrections which are included in the results in Graph Sheet no. 1.

Measurement Uncertainty

According to EN ISO 140-2:1992 precision of laboratory measurements expressed as the reproducibility of single-number quantities, including R_w, will normally be in the range of 1 dB to 3 dB.

Measurements in the Low-Frequency Range 50-80 Hz

Additional measurements in the frequency range 50-80 Hz were carried out. The measurement uncertainty of these measurements is larger than in the normal frequency range for building acoustic measurements 100-5000 Hz.

Generally, the measurements performed in the low-frequency range follow the procedure given in EN ISO 140-3:1995 for frequencies above 100 Hz.

For measurements in the 63 Hz and the 80 Hz one-third octave bands, the test procedure is identical to the procedure used for frequencies above 100 Hz.

Measurement in the 50 Hz one-third octave band is carried out using the reverse direction of measurement (source- and receiving room interchanged). Two corner positions (opposite the test wall) of a dodecahedron loudspeaker are used. Investigations have shown that in DELTA's test rooms, this procedure leads to measured sound reduction indices at 50 Hz, which are in good agreement with expected values. Details of the test procedure are given below.

The description and evaluation of the test procedure is reported in internal procedure DQP 87002.

Loudspeaker system:	Dodecahedron loudspeaker at two corner positions for measurements of sound pressure levels. Dodecahedron loudspeaker in one position for measurement of reverberation time.
Microphone system:	Rotating (32 s/rotation). Integration time: 2 × 64 s for measurements of sound pressure levels. The reverberation time is measured in twenty microphone positions distributed on the microphone path.
Sound signal:	Wideband pink noise
Filter:	One-third octave band filter with centre frequency 50 Hz

The sound reduction indices have not been corrected for sound transmission around the test specimen (flanking transmission) in the frequency range 50-80 Hz.

Spectrum Adaptation Terms for an Enlarged Frequency Range

The spectrum adaptation terms given below are determined according to EN ISO 717-1:1996, Annex B.

$C_{50\text{-}3150}$	-1 dB	$C_{tr,50\text{-}3150}$	-5 dB
$C_{50\text{-}5000}$	0 dB	$C_{tr,50\text{-}5000}$	-5 dB
$C_{100\text{-}5000}$	0 dB	$C_{tr,100\text{-}5000}$	-5 dB

Correction for Flanking Transmission

Frequency [Hz]	R'_{max} [dB]	Correction [dB]
100	42.3	0.0
125	44.2	0.0
160	47.6	0.0
200	49.8	0.0
250	52.3	0.0
315	54.2	0.0
400	55.8	0.0
500	60.3	0.0
630	61.9	0.0
800	63.6	0.0
1000	65.1	0.0
1250	66.8	0.0
1600	69.2	0.0
2000	71.9	0.0
2500	75.0	0.0
3150	77.4	0.0
4000	78.9	0.0
5000	79.2	0.0

Measuring Equipment

Instrument	Manufacturer	Type	Serial no.
Dual channel frequency analyzer	Norsonic	RTA 840-2	18751
Power amplifier	Master	DL 1800	DLB 69670698
Equalizer	dbx	2031	–
Sound level calibrator	Brüel & Kjær	4231	2309561
Microphone, source room	Brüel & Kjær	4166	1440622
Microphone, receiving room	Brüel & Kjær	4166	1072077
Microphone preamplifier, source room	Brüel & Kjær	2619	990095
Microphone preamplifier, receiving room	Brüel & Kjær	2619	855256
Rotating microphone boom, source room	Brüel & Kjær	3923	1357259
Rotating microphone boom, receiving room	Brüel & Kjær	3923	983339
Dodecahedron loudspeaker	Norsonic	229	20712
Dodecahedron loudspeaker	Norsonic	213	634
Open loudspeaker cabinet	DELTA	–	–
Loudspeaker unit	Celestion	G12H-100	–

The equipment is checked regularly in accordance with the DANAK guidelines.