TURKU AMK
TURKU UNIVERSITY OF APPLIED SCIENCES

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FINAS
Finnish Accreditation Service
T293 (EN ISO/IEC 17025)

DETERMINATION OF AIRBORNE SOUND INSULATION IN LABORATORY CONDITIONS

1 CLIENT

Roca Finland Oy, Jarkko Kosonen. Tender March 29, 2022. Order date April 20, 2022.

2 DESCRIPTION OF THE COMMISSION

Sound reduction index *R* was measured within 100-5000 Hz according to ISO 10140-2:2010. Weighted sound reduction index was determined according to ISO 717-1:2013.

3 RESULTS

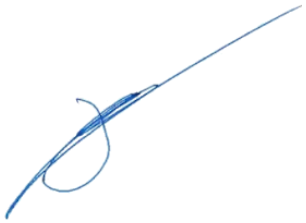
The test results are summarized in Table 1. Detailed results are presented in Annex 1.

Table 1.

Glass structure name	**R_w [dB]**
Roca Decibel Sliding	32
Roca Decibel Edge	33
Roca Decibel Edge, without threshold	27
Roca Decibel Standard + El Zone	34

In all elements, 5+5 mm laminated glass was used. Laminate thickness 0,76 mm.

4 SIGNATURES



Valtteri Hongisto
Research Group Leader

Juho Virtanen
Research Engineer

Turku University of Applied Sciences
Acoustics Laboratory

ANNEXES

Annex 1 – Test results (4 page)
Annex 2 – Structure drawings (2 pages)
Annex 3 – Mounting of specimen (3 pages)
Annex 4 – Measurement arrangements (2 pages)

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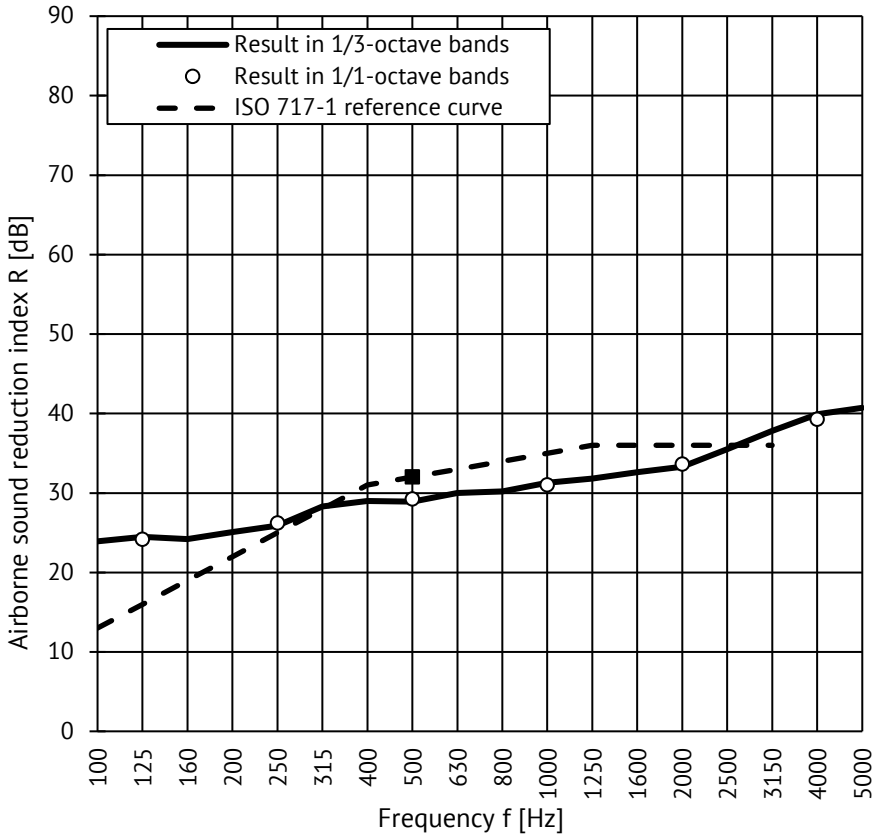
Determination of airborne sound insulation according to ISO 10140-2:2010 in laboratory conditions

Specimen id:	**Roca Decibel Sliding**
	5+5 mm glass
Manufacturer:	**Roca Industry Ab**
Client:	Roca Finland
Contact person:	Jarkko Kosonen
Mounting by:	Jarkko Kosonen
Test laboratory:	Turku University of Applied Sciences, Acoustic laboratory
	Joukahaisenkatu 7, 20520 Turku, Finland.
	https://akustiikka.turkuamk.fi/

Room temperature:	22 °C	Area of test element, S:	10,0 m^2
Relative humidity:	29 %	Mass per unit area:	25 kg/m^2
Source room volume:	82,3 m^3	Test date:	May 17, 2022
Receiving room volume:	76,4 m^3	Test file:	R170522C

	1/3	1/1
f	**R**	**R**
[Hz]	[dB]	[dB]
50	21,4	
63	14,9	18,5
80	24,9	
100	23,9	
125	24,5	24,2
160	24,2	
200	25,1	
250	25,9	26,2
315	28,3	
400	29,0	
500	28,9	29,3
630	30,0	
800	30,2	
1000	31,3	31,0
1250	31,8	
1600	32,6	
2000	33,3	33,6
2500	35,5	
3150	37,8	
4000	39,9	39,3
5000	40,7	



Single-number quantities according to ISO 717-1

R_w	**32 dB**
R_w+C	32 dB
R_w+C_{tr}	30 dB
$R_w+C_{100-5000}$	32 dB
$R_w+C_{50-3150}$	31 dB
$R_w+C_{50-5000}$	32 dB
$R_w+C_{tr,100-5000}$	30 dB
$R_w+C_{tr,50-3150}$	29 dB
$R_w+C_{tr,50-5000}$	29 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.

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Juho Virtanen
research engineer
test performer

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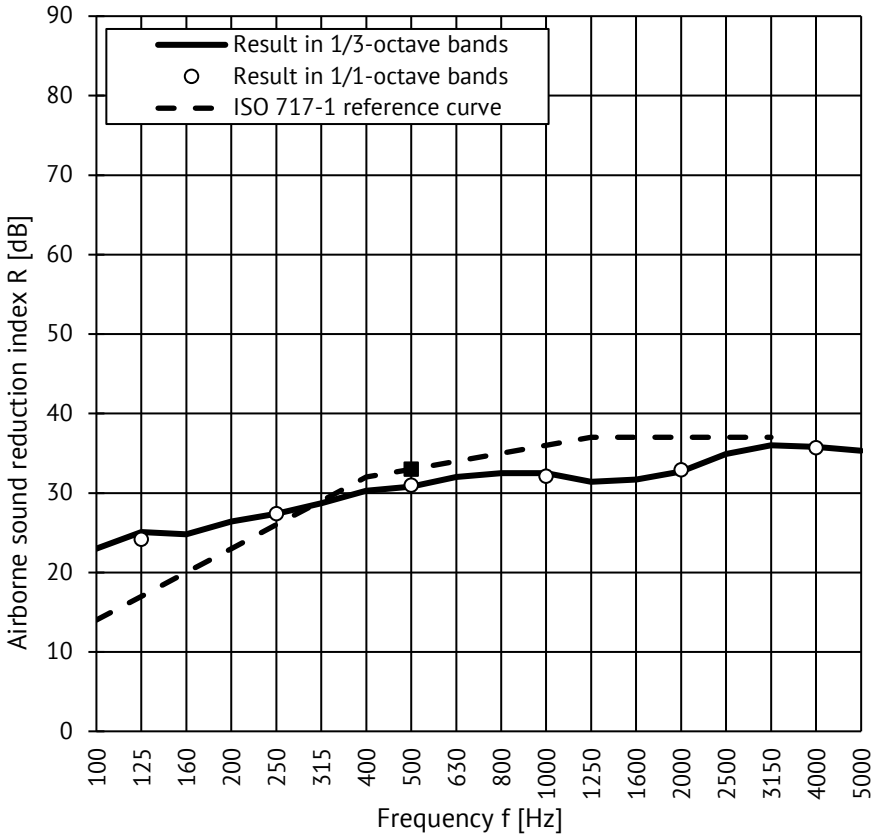
Determination of airborne sound insulation according to ISO 10140-2:2010 in laboratory conditions

Specimen id:	**Roca Decibel Edge**
	5+5 mm glass
Manufacturer:	**Roca Industry Ab**
Client:	Roca Finland
Contact person:	Jarkko Kosonen
Mounting by:	Jarkko Kosonen
Test laboratory:	Turku University of Applied Sciences, Acoustic laboratory
	Joukahaisenkatu 7, 20520 Turku, Finland.
	https://akustiikka.turkuamk.fi/

Room temperature:	22 °C	Area of test element, S:	10,0 m^2
Relative humidity:	33 %	Mass per unit area:	25 kg/m^2
Source room volume:	82,3 m^3	Test date:	May 18, 2022
Receiving room volume:	76,4 m^3	Test file:	R180522A

	1/3	1/1
f	**R**	**R**
[Hz]	[dB]	[dB]
50	21,6	
63	15,5	18,9
80	24,1	
100	23,0	
125	25,1	24,2
160	24,8	
200	26,4	
250	27,4	27,4
315	28,7	
400	30,3	
500	30,8	31,0
630	32,0	
800	32,5	
1000	32,5	32,1
1250	31,4	
1600	31,7	
2000	32,7	32,9
2500	34,9	
3150	36,0	
4000	35,8	35,7
5000	35,3	



Single-number quantities according to ISO 717-1

R_w	**33 dB**
R_w+C	32 dB
R_w+C_{tr}	31 dB
$R_w+C_{100-5000}$	33 dB
$R_w+C_{50-3150}$	32 dB
$R_w+C_{50-5000}$	33 dB
$R_w+C_{tr,100-5000}$	31 dB
$R_w+C_{tr,50-3150}$	30 dB
$R_w+C_{tr,50-5000}$	30 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.

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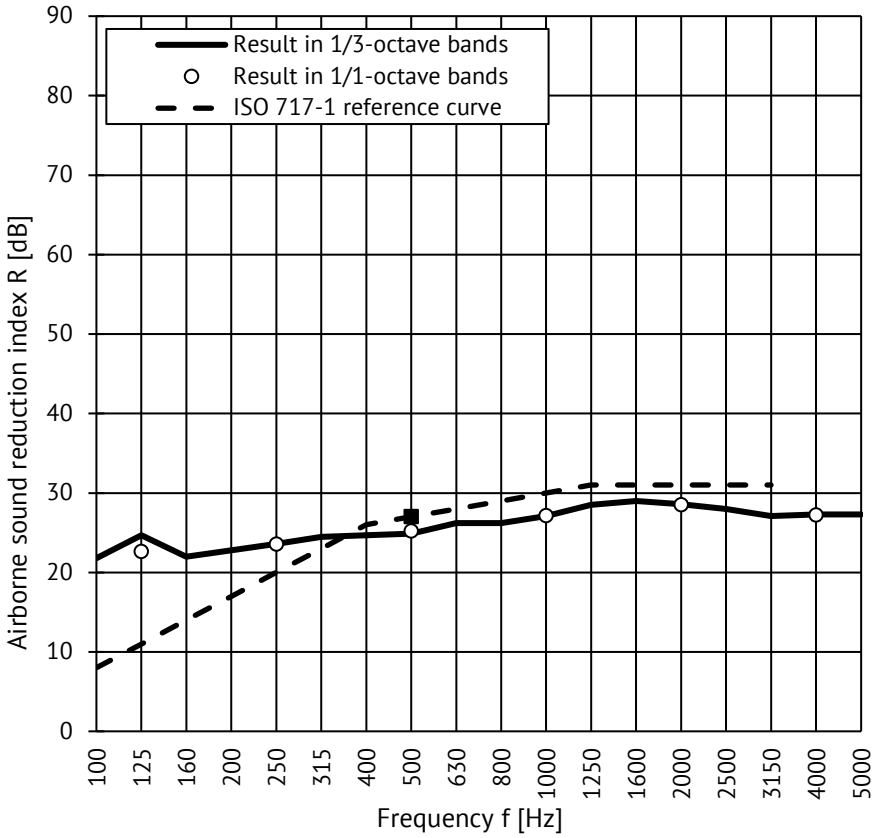
Determination of airborne sound insulation according to ISO 10140-2:2010 in laboratory conditions

Specimen id:	**Roca Decibel Edge, without threshold**
	5+5 mm glass
Manufacturer:	**Roca Industry Ab**
Client:	Roca Finland
Contact person:	Jarkko Kosonen
Mounting by:	Jarkko Kosonen
Test laboratory:	Turku University of Applied Sciences, Acoustic laboratory
	Joukahaisenkatu 7, 20520 Turku, Finland.
	https://akustiikka.turkuamk.fi/

Room temperature:	22 °C	Area of test element, S:	10,0 m^2
Relative humidity:	33 %	Mass per unit area:	25 kg/m^2
Source room volume:	82,3 m^3	Test date:	May 18, 2022
Receiving room volume:	76,4 m^3	Test file:	R180522B

	1/3	1/1
f	**R**	**R**
[Hz]	[dB]	[dB]
50	21,0	
63	15,2	18,4
80	23,1	
100	21,8	
125	24,7	22,6
160	22,0	
200	22,8	
250	23,6	23,6
315	24,5	
400	24,7	
500	24,9	25,2
630	26,2	
800	26,2	
1000	27,1	27,2
1250	28,5	
1600	29,0	
2000	28,6	28,5
2500	28,0	
3150	27,1	
4000	27,3	27,2
5000	27,3	



Single-number quantities according to ISO 717-1

R_w	**27 dB**
R_w+C	27 dB
R_w+C_{tr}	26 dB
$R_w+C_{100-5000}$	27 dB
$R_w+C_{50-3150}$	27 dB
$R_w+C_{50-5000}$	27 dB
$R_w+C_{tr,100-5000}$	26 dB
$R_w+C_{tr,50-3150}$	26 dB
$R_w+C_{tr,50-5000}$	26 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.

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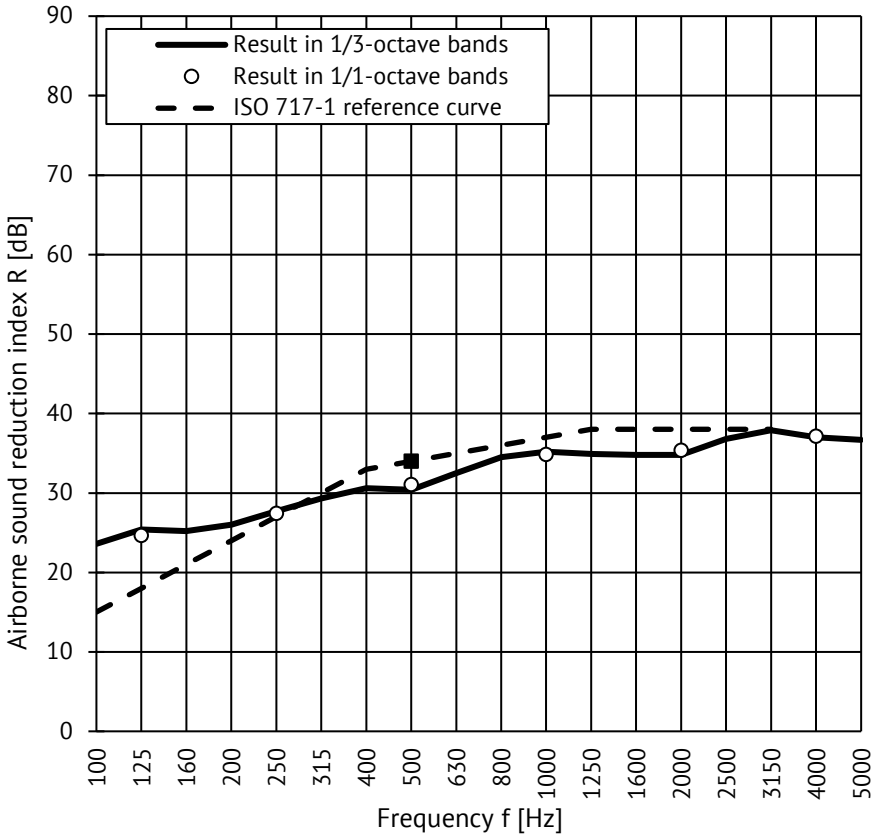
Determination of airborne sound insulation according to ISO 10140-2:2010 in laboratory conditions

Specimen id: **Roca Decibel Standanrd + El Zone**
5+5 mm glass
Manufacturer: **Roca Industry Ab**
Client: Roca Finland
Contact person: Jarkko Kosonen
Mounting by: Jarkko Kosonen
Test laboratory: Turku University of Applied Sciences, Acoustic laboratory
Joukahaisenkatu 7, 20520 Turku, Finland.
https://akustiikka.turkuamk.fi/

Room temperature:	22 °C	Area of test element, S:	10,0 m^2
Relative humidity:	33 %	Mass per unit area:	25 kg/m^2
Source room volume:	82,3 m^3	Test date:	May 18, 2022
Receiving room volume:	76,4 m^3	Test file:	R180522C

	1/3	1/1
f	**R**	**R**
[Hz]	[dB]	[dB]
50	22,1	
63	17,3	20,3
80	24,6	
100	23,6	
125	25,4	24,7
160	25,2	
200	26,0	
250	27,7	27,5
315	29,3	
400	30,6	
500	30,4	31,1
630	32,5	
800	34,5	
1000	35,2	34,9
1250	34,9	
1600	34,8	
2000	34,8	35,4
2500	36,8	
3150	37,9	
4000	37,0	37,2
5000	36,7	



Single-number quantities according to ISO 717-1

R_w	**34 dB**
R_w+C	34 dB
R_w+C_{tr}	32 dB
$R_w+C_{100-5000}$	34 dB
$R_w+C_{50-3150}$	34 dB
$R_w+C_{50-5000}$	34 dB
$R_w+C_{tr,100-5000}$	32 dB
$R_w+C_{tr,50-3150}$	31 dB
$R_w+C_{tr,50-5000}$	31 dB

Signs F and B indicate that the declared result is an underestimate in this frequency band. The true value is larger.

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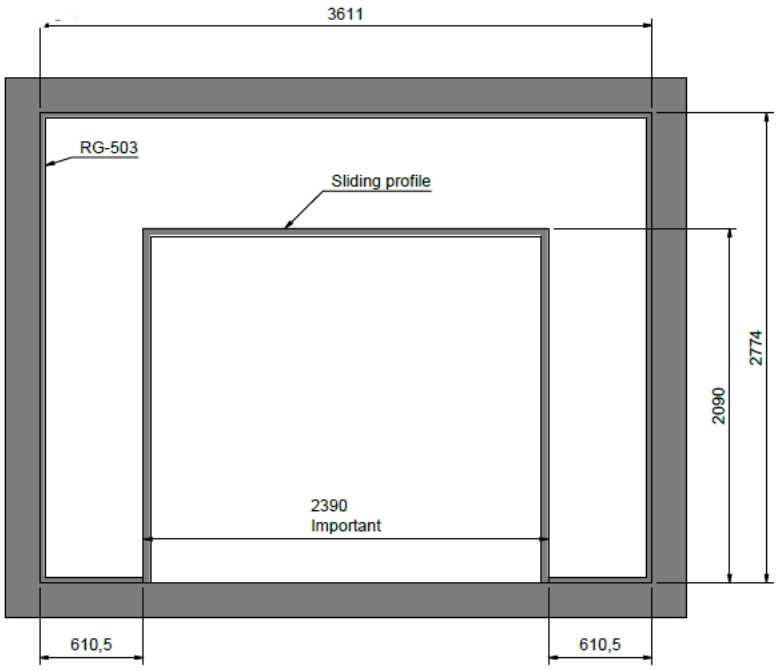
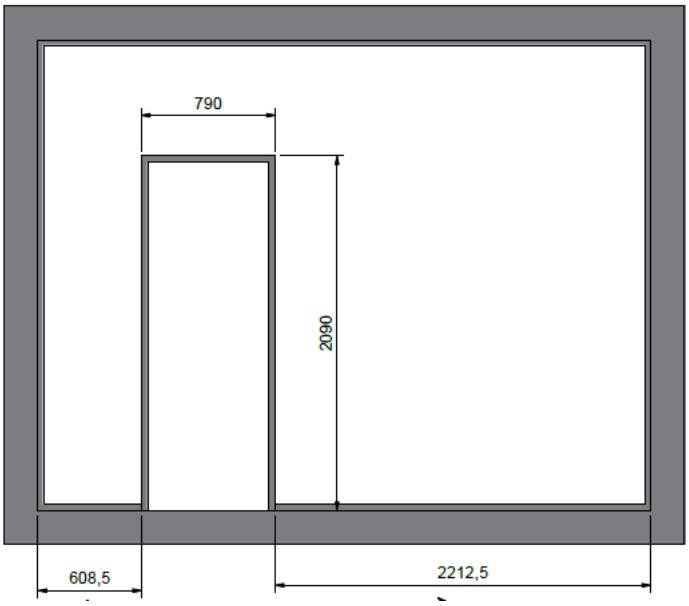
ANNEX 2 – STRUCTURE DRAWINGS

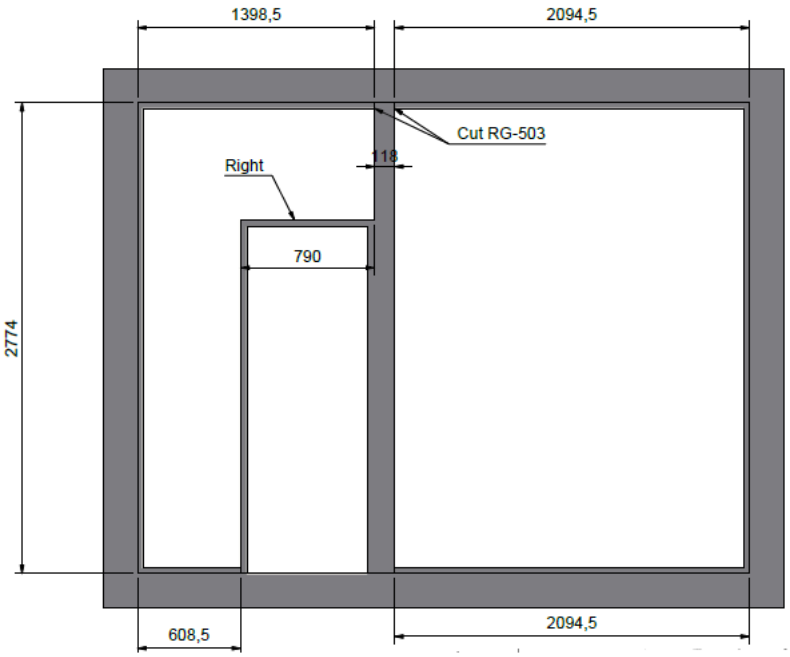
The structure drawing was provided by the client. Turku University of Applied Sciences has not verified the structure.



Roca Decibel Sliding



Roca Decibel Edge



Roca Decibel Standard + El Zone

ANNEX 3 – MOUNTING OF SPECIMEN

Mounting was done by Roca Industry Ab. Glass structure was mounted to the test opening with rails produced by Roca Industry Ab. Edges of the structure were sealed airtight with duct tape. All the tested structures had the same frame. The glass was 5+5 mm thick. The mass of the glass was 25.0 kg/m^2. The glasses were connected to each other with tape and the edges were sealed with rubber insulation strip. For one of the tests, the door's threshold was removed. Size of the test opening was 10,04 m^2.

The pictures are taken from the sending room.

Figure A3.1. Roca Decibel Sliding

Figure A3.2. Roca Decibel Edge

Figure A3.3. Roca Decibel Standard + El Zone

Turun Lasipalvelu OY
Akselintie 13
20200 Turku, Finland

DECLARATION OF CONFORMITY

W-GLASS OÜ (company reg.no 10823375, address Tööstuse 47, Tallinn 10416 Estonia) hereby declares that the following orders manufactured for :

Turun Lasipalvelu OY

Order confirmation

W175922 – 18,46 m² 55.2 PVB Sound Control laminated glass

Raw glass manufacturer Pilkington Glass LLC.
PVB foils manufacturer Kuraray Trosifol®

Laminated glass consist of 5 mm clear glass + PVB Trosifol BGR20 Sound Control 0,76 mm + 5 mm clear glass

These orders have been manufactured by OÜ W-Glass, Tööstuse 47, 10416 Tallinn, reg.nr.10538189 and grants the demands of standard EVS-EN 14449:2005.

This certificate assumes that OÜ W-Glass continuously follows the requirements of EVS-EN 14449:2005 and is under the systematic quality surveillance of the VTT Technical Research Centre of Finland in compliance with the existing quality surveillance agreement.

The certificate is based on the quality assessment report Nº VTT-S-06456-17 of November 24th, 2017 of VTT Technical Research Centre of Finland.

Andrei Luige
Production manager

Date 18.05.2022

W-Glass OÜ
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EE712200221052217947 Swedbank

ANNEX 4 – MEASUREMENT ARRANGEMENTS

1 Acoustical measurements

The sound was produced in the source room using five different sound sources and with five uncorrelated pink noise generators (Behringer Ultra curve DEQ 2496). The loudspeaker signals were amplified with three terminal amplifiers (QSC RMX 850, 850, 2450). The sound pressure level in the source room was measured using the rotating microphone boom (Brüel&Kjær 3923, serialnr. 1357240), the condenser microphone and the preamplifier (Brüel&Kjær 4165 and Brüel&Kjær 2669, serialnr. 1829762). The sound pressure level in the receiving room was measured using the rotating microphone boom (Brüel&Kjær 3923, serialnr. 2036590), the condenser microphone (Brüel&Kjær 4165, serialnr. 1867292) and the preamplifier (Brüel&Kjær 2669, serialnr. 1866352). The radius of rotation was 100 cm in both rooms. The averaging time was 64 seconds. The level measurements were made simultaneously. The microphones and the measurement channels were calibrated before the measurements with the sound level calibrator (Brüel&Kjær 4231, serialnr. 2376479).

For the reverberation time measurement in the receiving room, the pink noise test signal was produced with the real time analyzer and amplified with the terminal amplifier (QSC 900 W USA). Two fixed loudspeaker positions were used, and the microphone was placed in three positions. The reverberation time was determined in conformance with ISO 3382-2:2008 using 2 averaged decay signals from the decay range of −5 to -25 dB in each measurement. The sound analysis was made with the two-channel real time analyzer (Norsonic 121, serialnr. 31416).

The acoustical measurement equipment does not fulfil the requirements of IEC 61672, because the manufacturer has not tested the real time analyzer in conformance with IEC 61672-1 and 2.
The acoustical measurement equipment fulfilled the following IEC standards and grades of accuracy:

IEC 60651	Sound level meters (replaced by IEC 61672)	**type 1**
IEC 60804	Integrating sound level meters (replaced by IEC 61672)	**type 1**
IEC 61260	Octave-band and fractional-octave-band filters	**class 1**
IEC 60942	Sound level calibrators	**class 1**

2 Other measurements

The temperature and the relative humidity of the measurement rooms were measured using an environmental measurement device (Thermo Recorder TR-73U, serialnr. E00009). The specimen was weighed with a weighing machine (Vetek TI-500 SL, serialnr. 47359). The dimensions of the specimen were measured with a roll meter (Stanley Fat Max).

3 The uncertainty of sound insulation measurement

The uncertainty of reproducibility expresses the differences between the laboratories. The procedure to determine uncertainty of sound insulation in laboratory tests is defined in standard ISO 12999-1:2014. According to ISO 12999-1 the standard uncertainty for reproducibility of R varies within the measured frequency range (Figure below). The standard uncertainty for reproducibility of the weighted sound reduction index R_w is 1.2 dB.

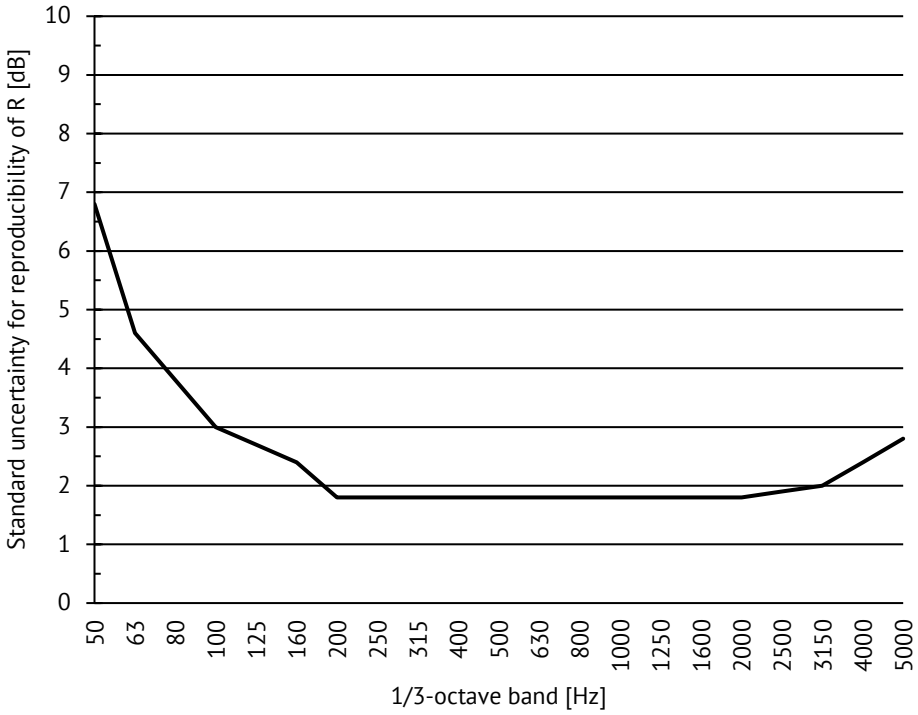

Figure. Standard uncertainty for reproducibility of sound reduction index R within 50–5000 Hz according to ISO 12999-1:2014.

4 References to the ISO standards

ISO 10140-2:2010 (E) Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation

ISO 717-1:2013 (E) Acoustics – Rating of sound insulation of building elements - Part 1: Airborne sound insulation

ISO 3382-2:2008 (E) Acoustics – Measurement of room acoustic parameters - Part 2: Reverberation time in ordinary rooms

ISO 12999-1:2014 (E) Acoustics – Determination and application of measurement uncertainties in building acoustics – Part 1: Sound insulation.