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

DETERMINATION OF ACOUSTIC ABSORPTION COEFFICIENT IN LABORATORY CONDITIONS

1 CLIENT

ArteMano acoustics, Paavo Orlandini. Tender January 22, 2016.

2 DESCRIPTION OF THE COMMISSION

Sound absorption coefficient α_S was measured for the specimen within 100–5000 Hz according to ISO 354:2003. Sound absorption class was determined according to EN ISO 11654:1997.

3 RESULTS

The sound absorption class for the specimen was **A**. Detailed results are presented in Annex 1.

4 SIGNATURES

Valtteri Hongisto
Senior research scientist

Petra Virjonen
Research scientist

Turku University of Applied Sciences
Technology, Environment and Business
Indoor Environment, Acoustics

ANNEXES

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

Determination of acoustic absorption coefficient according to ISO 354:2003 in laboratory conditions

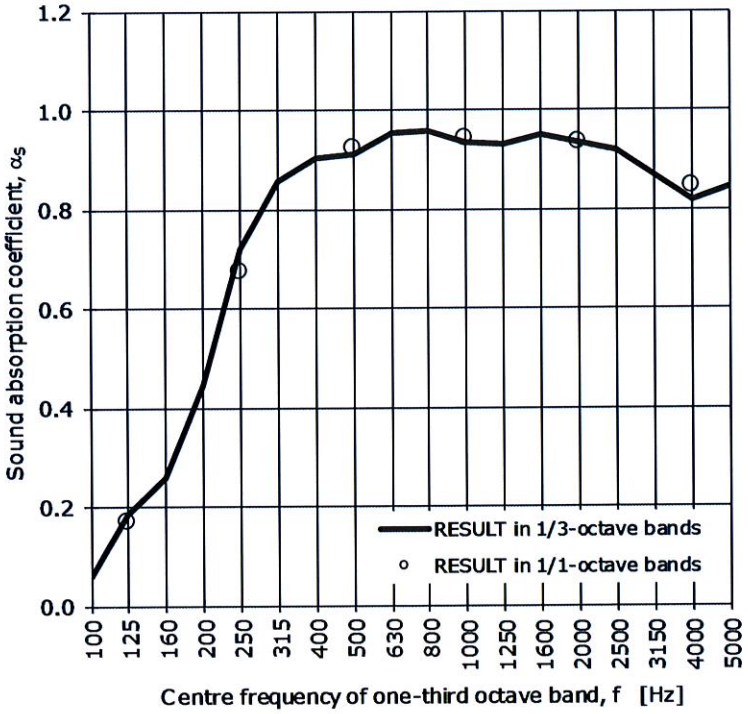
Specimen id: **Wool A+ absorption panel 50 mm**

Manufacturer: ArteMano acoustics
Client: Paavo Orlandini
Mounting by: Paavo Orlandini
Test laboratory: Turku University of Applied Sciences, Indoor environment, acoustics
Lemminkäisenkatu 14-18 B, 20520 Turku, Finland. www.turkuamk.fi

Specimen area:		10.8 m^2		
Temperature of test room:	21	21 °C	(without / with specimen)	
Relative humidity:	60	57 %	(without / with specimen)	
Atmospheric pressure:	98	98 kPa	(without / with specimen)	

Test room volume: 155 m^3
Room boundary area: 179 m^2
Test date: 12 Feb 2016
Test file identification: T120216a

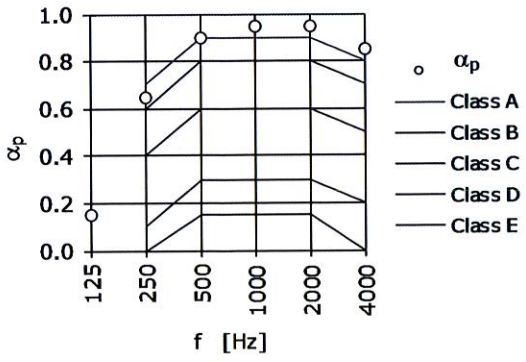
f (Hz)	1/3 αs	1/1 αs	1/1 αp	
100	0.06			
125	0.18	0.17	0.15	**
160	0.26			**
200	0.44			
250	0.72	0.67	0.65	
315	0.86			
400	0.90			
500	0.91	0.92	0.90	
630	0.95			
800	0.96			
1000	0.93	0.94	0.95	
1250	0.93			
1600	0.95			
2000	0.93	0.93	0.95	
2500	0.92			
3150	0.87			
4000	0.82	0.84	0.85	
5000	0.85			



Absorption class (EN ISO 11654)
A

** Total absorption area of the empty test room is higher than ISO 354 requires.

The uncertainty of the test result is higher than ISO 354 expects.



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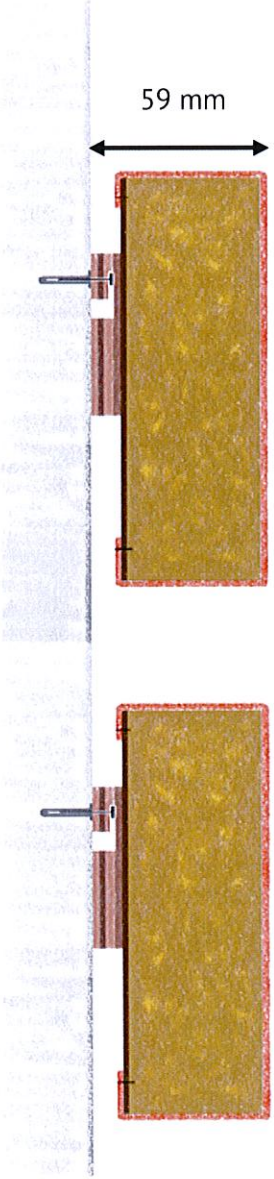
Petra Virjonen
research scientist
test performer

ANNEX 2 – STRUCTURE DRAWINGS

ArteMano acoustics ©



AMA FELT DESIGN ©

WoolA+-rakenne
hyödyllisyysmallisuojattu

ANNEX 3 – MOUNTING OF SPECIMEN

The specimen was mounted on the floor of the reverberation room in conformance with **ISO 354:2003 Annex B, Type A mounting**. 1200 x 600 mm panels were arranged in a rectangular shape (3 x 4 panels) having a distance of approximately 40 mm between the individual panels. The panels were laid on the mounting fixtures used in the actual application without any adhesives.

The side edges of the specimen were not covered as this is the usual installation of the panels. The area of the sides where included in the calculation of the test specimen area.

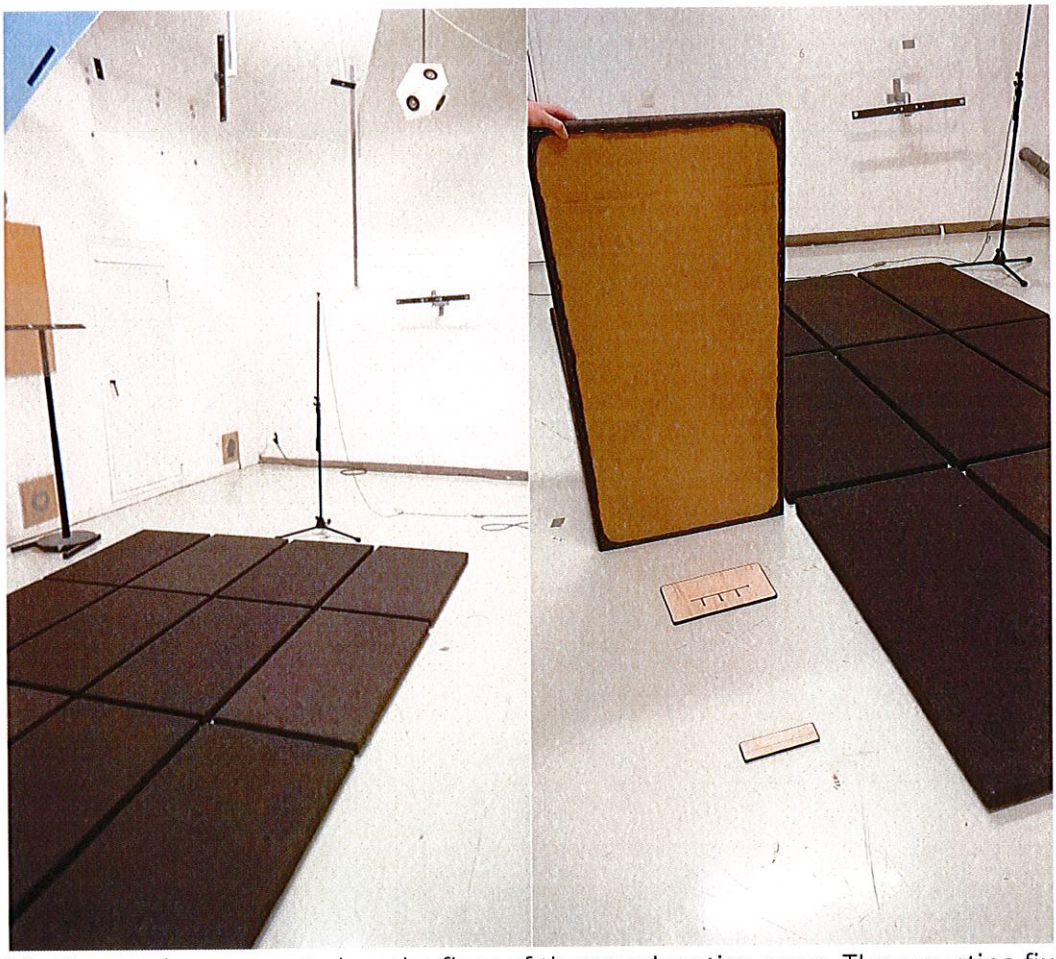


Figure A3.1. The specimen mounted on the floor of the reverberation room. The mounting fixtures are shown in the picture at right.

ANNEX 4 – MEASUREMENT ARRANGEMENTS

1 Acoustical measurements

The test signal was produced to the test room using three fixed omnidirectional loudspeakers (6 x Seas W12CY001). The test signal (pink noise) was produced by a real time analyzer (Norsonic 121) and amplified with terminal amplifier (QSC 1300 W USA). The sound pressure level in the reverberation room was measured with a condenser microphone on a tripod (Bruel&Kjær 4190 equipped with a pre-amplifier Bruel&Kjær 2669).

The reverberation time at third-octave bands was measured with the real time analyzer (Norsonic 121) using 20 dB decay range. All frequency bands were measured using 2 sources simultaneously and 6 microphone locations. In every location 3 decays were measured. The total number of reverberation time measurements was 36.

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**

The test laboratory operates in conformance with EN/ISO/IEC 17025.

2 Other measurements

The temperature, the ambient atmospheric pressure and the relative humidity of the measurement room were measured using an environmental measurement device (Thermo Recorder TR-73U). The specimen was weighed with a 150 kg precision weighing machine (PM 150). The dimensions of the specimen were measured with a roll meter (K-Prof).

3 The test room

The reverberation room was equipped with six fixed diffuser panels. The positions were selected randomly in respect with altitude, angle and position. The amount of diffusers and their arrangement fulfills the requirements of Annex A in ISO 354. The reverberation time of the reverberation room fulfills the requirements of ISO 354 for 155 m^3 test room except for the third octave bands 160 and 200 Hz, where the reverberation time was at most 17 % below the minimum required reverberation time.

4 References to the ISO standards

Test: ISO 354:2003 (E) Acoustics - Measurement of sound absorption in a reverberation room, International Organization for Standardization, 2003, Genève, Switzerland.

SFS-EN ISO 11654:1997 (E) Acoustics - Sound absorbers for use in buildings - Rating of sound absorption, International Organization for Standardization, 1997, Genève, Switzerland.