PIRMIN JUNG

Determination of the sound absorption in the reverberation room, method according to EN ISO 354

Test object	Testseries Phon 40 mm System Classic Base
Test lab	Reverberation room Institut für Lärmschutz Kühn & Blickle Gewerbestrasse 9b 6314 Unterägeri
Applicant	BASWA acoustic AG Marmorweg 10 6283 Baldegg

Created	Unterägeri, 17. June 2017
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1 Introduction

The company BASWA acoustic AG commissioned us to evaluate the sound absorption coefficient of an acoustic system.
The reverberation time measurements to evaluate the sound absorption coefficient took place on 17.06.2017 in the reverberation room of the Instituts für Lärmschutz Kühne & Blickle.

2 General provisions

The measurements are carried out according to the following standard:

- DIN EN ISO 354 (2003) „ Acoustics - Measurement of sound absorption in a reverberation room “

3 Description of the test specimens

The test specimen consist of elements which are installed in a rectangular wooden frame. The test specimen has an area of 12 m^2.
The description of the specimen is listed in the following table.

Name	Aufbau	Disposition
BASWA Phon Classic Base 40mm	12.5 mm gypsum board BASWA Fix K, 1 - 1.5 mm, Adhesive BASWA Phon acoustic panel, 36mm BASWA Fill, seamfiller BASWA Base, ca. 1.5 – 2.0 mm, base layer BASWA Base, ca. 1.5 – 2.0 mm, final layer	suspended 200 mm on concrete

4 Measurements

4.1 Measuring Instruments

The sound measurements were carried out with the following measuring instruments:

- NTi-Audio Mod. XL2 sound level meter
- M2230 measurement microphone, class 1 certification, dynamic range of 16 to 139 dB(A)
- Outline dodecahedron loudspeakers with Outline GSA GlobeAmp amplifier, four channel

4.2 - Measurement of reverberation time

The measurements were carried out according to the instructions on the EN ISO 354 Standard. For each test specimen five microphone positions and two loudspeaker positions were considered; 15 independent decay curves were measured.
The reverberation time in the empty room is shown in the following diagram:

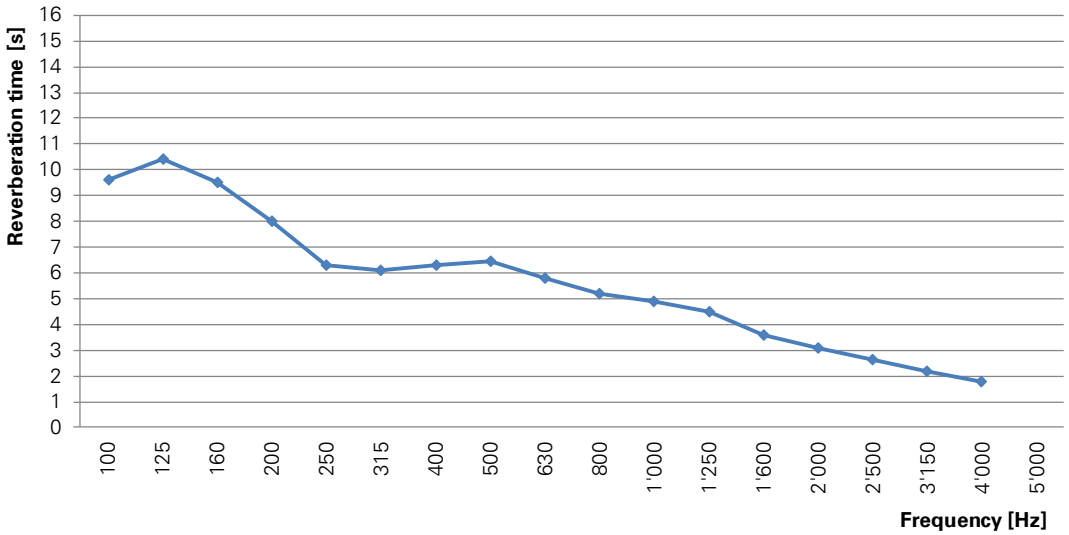

Figure 1: Reverberation time in empty room

The room temperature during the measurements has been constant by 19°C and the relative humidity has been 72 %.

4.3 Evaluation of sound absorption

The sound absorption coefficient α_S of the test specimen is calculated using the formula:

$$\alpha_S = \frac{\frac{55.3}{c} \cdot V \cdot \left(\frac{1}{T_2} - \frac{1}{T_1}\right)}{S}$$

where:

V:	Volume of the reverberation room (212 m^3)
S:	Area of the test specimen (11.5m^2)
T_1:	Reverberation time of the empty reverberation room (in s)
T_2:	Reverberation time of the reverberation room with the test specimen (in s)
c:	Velocity of sound in air (in m/s) : c = 343 m/s by 20°C

The Indicators (L), (M), or (H) provide additional information on the frequency response of the sound absorption at low frequencies (L), mid-frequency (M) and high frequencies (H).

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Acoustic absorption values according to ISO 354

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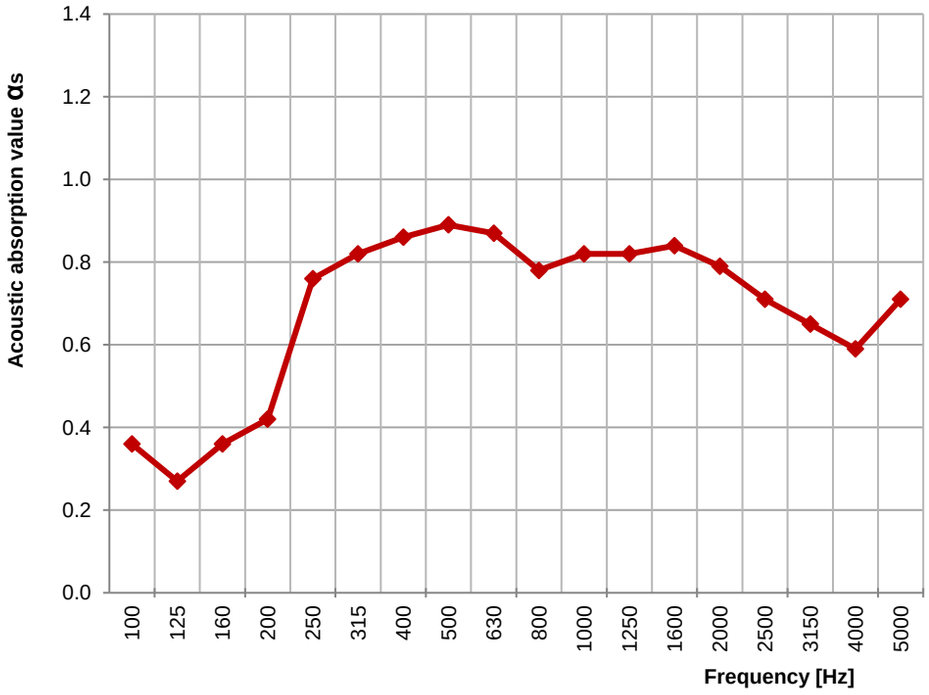
Acoustic absorption as measured in reverberation room

Applicant:	BASWA acoustic AG Marmorweg 10, 6283 Baldegg
Test date:	17.06.2017
Project:	Testserie Phon 40 mm System Classic Base
Measurement:	**Acoustic absorption**
Test lab:	Hallraum Institut für Lärmschutz Kühn & Blickle Gewerbestrasse 9b, 6314 Unterägeri
Test object:	**BASWA Phon Classic Base 40mm - on concrete**

Composition:
12.5 mm gypsum board
BASWA Fix K, 1 - 1.5 mm, Adhesive
BASWA Phon acoustic panel, 36mm
BASWA Fill, seamfiller
BASWA Base, ca. 1.5 – 2.0 mm, base layer
BASWA Base, ca. 1.5 – 2.0 mm, final layer

Test surface [m^2]: 12 m^3
Volume reverberation room [m^3]: 212 m^3
Temperature [°C]: 19 °C
Humidity [%]: 72 %

Frequency [Hz]	α_s	α_p
	1/3 oct	1/1 oct
100	0.36	0.35
125	0.27	
160	0.36	
200	0.42	0.65
250	0.76	
315	0.82	
400	0.86	0.85
500	0.89	
630	0.87	
800	0.78	0.80
1000	0.82	
1250	0.82	
1600	0.84	0.80
2000	0.79	
2500	0.71	
3150	0.65	0.65
4000	0.59	
5000	0.71	



Certificate according to ISO 11654:

Acoustic absortion value **αw = 0.80**
Acoustic absorption class B

Certificate according to ASTM C423 - 09a:

Noise Reduction Coefficient NRC = 0.80
Sound Absorption Average SAA = 0.78

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Acoustic absorption values according to ISO 354

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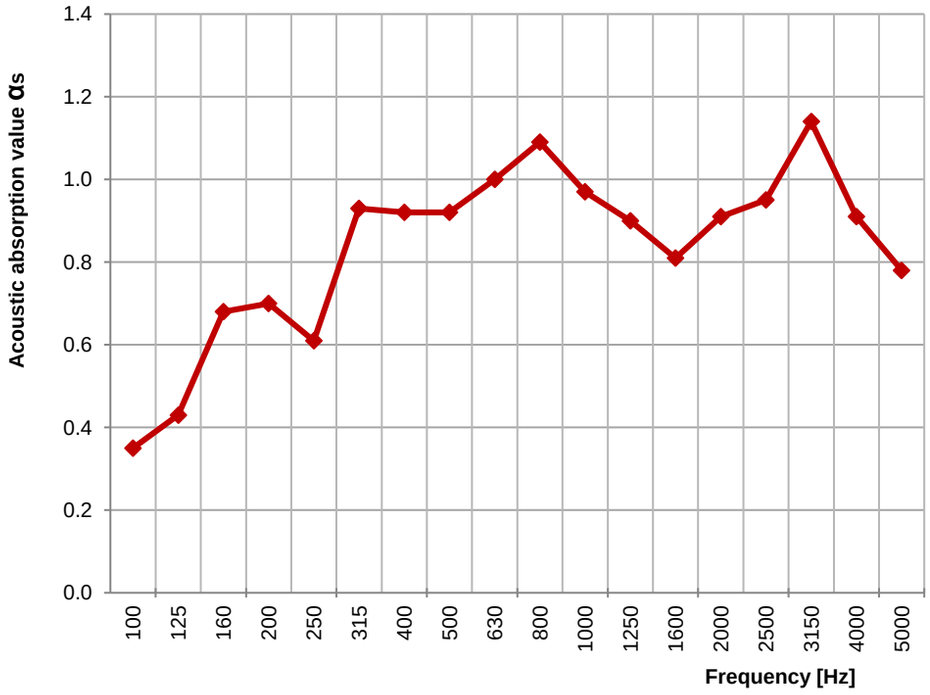
Acoustic absorption as measured in reverberation room

Applicant:	BASWA acoustic AG Marmorweg 10, 6283 Baldegg
Test date:	17.06.2017
Project:	Testserie Phon 40 mm System Classic Base
Measurement:	**Acoustic absorption**
Test lab:	Hallraum Institut für Lärmschutz Kühn & Blickle Gewerbestrasse 9b, 6314 Unterägeri
Test object:	**BASWA Phon Classic Base 40mm - suspended 200 mm**

Composition:
12.5 mm gypsum board
BASWA Fix K, 1 - 1.5 mm, Adhesive
BASWA Phon acoustic panel, 36mm
BASWA Fill, seamfiller
BASWA Base, ca. 1.5 – 2.0 mm, base layer
BASWA Base, ca. 1.5 – 2.0 mm, final layer

Test surface [m^2]: 12 m^3
Volume reverberation room [m^3]: 212 m^3
Temperature [°C]: 19 °C
Humidity [%]: 72 %

Frequency [Hz]	α_s	α_p
	1/3 oct	1/1 oct
100	0.35	0.50
125	0.43	
160	0.68	
200	0.70	0.75
250	0.61	
315	0.93	
400	0.92	0.95
500	0.92	
630	1.00	
800	1.09	1.00
1000	0.97	
1250	0.90	
1600	0.81	0.90
2000	0.91	
2500	0.95	
3150	1.14	0.95
4000	0.91	
5000	0.78	



Certificate according to ISO 11654:

Acoustic absortion value **αw = 0.95**
Acoustic absorption class A

Certificate according to ASTM C423 - 09a:

Noise Reduction Coefficient NRC = 0.85
Sound Absorption Average SAA = 0.89

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