

Test Report
for
Measurements of sound absorption coefficients

Stage Velour "Lightabsorber D18"
provided by
Tüchler Bühnen- und Textiltechnik GmbH

in the reverberation room
of Quiring Consultants
according to
ISO 354

Client:

Tüchler Bühnen- und Textiltechnik GmbH

Rennbahnweg 78
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Grundlagen:

- o Measurements on June 5th/6th, 2019
- o ISO 354
- o ISO 11654

This report consists of
7 pages and 2 supplements

Aldrans, June 13th, 2019
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1. Subject:

In May 2019, we received the order by Tüchler Bühnen- und Textiltechnik GmbH, Rennbahnweg 78, A-1220 Vienna, Austria, to perform measurements of the sound absorption coefficients of a Stage Velour type "Lightabsorber D18" according to ISO 354

- plane without folding
- with 100 % folding arrangement (100% fabric addition)

2. Measurements:

The measurements were carried out on June 5th and 6th 2019 in the Quiring Consultants' own reverberation room, Unternehmerzentrum 5, 6071 Aldrans, Austria. - The following measurement equipment was used:

- Calibrator Larson-Davis Type CAL200
- Sound source Brüel & Kjær Type 4224
- Real-time analyzer NTI Audio XL2
- Microphone NTI Audio M2210

The two measured samples

- plane without folding
- with 100 % folding arrangement (100% fabric addition)

Area specific mass:	Appx. 600 g/m ²
Width	3.800 mm
Height	2.900 mm
Material	100% cotton

were arranged as suspended curtain in the reverberation room in a medium distance of 10 cm in front of a reverberant wall

The volume of the reverberation room is 200 m³. To achieve a diffuse sound field, diffusers of three different sizes and in sufficient total area according to ISO 354 are randomly mounted.

The test material sample reduces the reverberation time in the reverberation room. The difference between the reverberation times in the empty reverberation room and in the room equipped with the test specimens is used to calculate the sound absorption coefficient as follows:

$$\alpha_s = \frac{A_T}{S} = \frac{55,3 \cdot V \cdot \left(\frac{1}{c_2 T_2} - \frac{1}{c_1 T_1} \right) - 4 \cdot V \cdot (m_2 - m_1)}{S}$$

α_s sound absorption coefficient [-]

A_T equivalent absorption area of the test material [m²]

S Area of the test material [m²]

c_1 Velocity of sound in the empty reverberation room [m/s]

c_2 Velocity of sound in the reverberation room with test material [m/s]

$c = (331 + 0,6 \cdot t / ^\circ\text{C}) \dots 15^\circ\text{C} < t < 30^\circ\text{C}$

t Temperature in the reverberation room [°C]

T_1 Reverberation time in the empty reverberation room [s]

T_2 Reverberation time in the reverberation room with test material [s]

V Volume the empty reverberation room [m³]

m_1 Absorption coefficient of air according to ISO 9613-1 in the empty reverberation room [m⁻¹]

m_2 Absorption coefficient of air according to ISO 9613-1 in the reverberation room with test material [m⁻¹]

The measurement of the reverberation time was carried out with third-octave pink noise, emitted from a loudspeaker source in the reverberation room.

The test specimens were measured in accordance with the specifications of ISO 354.

The measurement was carried out at a mean air temperature of 23,0 ° and a mean relative humidity of 52% RH.

The following tables 1 and 2 as well as in supplements 1 and 2 show the frequency responses of the sound absorption coefficients as mean values of 48 series of measurements at different microphone and speaker positions.

**Table 1: Sound absorption coefficients α_s - third-octaveband
Stage velour "Lightabsorber D18"**

f [Hz]	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
Setup 1 without folding	0,01	0,01	0,02	0,02	0,15	0,27	0,35	0,30	0,30	0,31	0,32	0,30	0,31	0,35	0,36	0,38	0,45	0,40
Setup 2 fabric addition	0,01	0,07	0,12	0,19	0,41	0,60	0,69	0,71	0,67	0,62	0,60	0,56	0,54	0,53	0,54	0,58	0,62	0,64

The values of the practical sound absorption α_{pi} (rounded in steps of 0,05) are given in the following table 2.

**Table 2: Sound absorption coefficients α_{pi} – octave band
Stage velour "Lightabsorber D18"**

f [Hz]	125	250	500	1000	2000	4000
Setup 1 without folding	0,00	0,15	0,30	0,30	0,35	0,40
Setup 2 100% fabric addition	0,05	0,40	0,70	0,60	0,55	0,60

3. Classification according to ISO 11654

According to ISO 11654 "Acoustics - Sound absorbers for use in buildings - Rating of sound absorption" the classification of sound absorber classes is made according to the following table

sound absorber class	α_w - weighted sound absorber coefficient
A	0,90; 0,95; 1,0
B	0,80; 0,85
C	0,60; 0,65; 0,70; 0,75
D	0,30; 0,35; 0,40; 0,45; 0,50; 0,55
E	0,15; 0,20 ;0,12
not classified	0,00; 0,05; 0,10

The tested Stage Velour "Lightabsorber D18" according to supplements 1 and 2 can be rated as follows:

- **plane without folding, arranged as curtain 10 cm from a reverberant wall:**

weighted sound absorber coefficient

$\alpha_w = 0.35$, sound absorber class D

- **with folded arrangement (100% fabric addition), arranged as curtain 10 cm from a reverberant wall:**

weighted sound absorber coefficient

$\alpha_w = 0.60$, sound absorber class C

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