TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p.
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Teplice Testing Facility
L 1018.3

PROTOCOL

Test Laboratory No. 1018.3
accredited according to ČSN EN ISO/IEC 17025 by the Czech Institute for Accreditation

No. 040-053918

on test of sound absorption capacity according to ČSN EN ISO 354:2003

Client:	DROMEAS S.A Papapanagiotou
Address:	Industrial Area of Serres Zip Code 62121 Greece
Company registration number (VAT):	094 104 476
Manufacturer:	DROMEAS S.A Papapanagiotou
Address:	Industrial Area of Serres Zip Code 62121 Greece
Test samples:	Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm)
Order:	Z040160379

Number of pages including title page: 5 No. of Annexes: 2

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Approved by:

Ing. Pavel Bartoš
testing facility deputy manager

Copy No.:
No. of copies: 3

Teplice on 20 December 2016

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Testing laboratory stamp No. 1018.3

Declaration: **1)** The test results presented in this Report apply only to the tested object and do not substitute any other documents.
2) The report may not be reproduced in any other way except in its entirety, without the written approval of the testing laboratory.
3) Evaluation of the results according to the standards was done above the framework of the activities of an accredited test laboratory

1. General

Based on Order testing was done of the sound absorptivity of plastic panels 2500X1500X38 MM (Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm)) which was supplied by the manufacturer DROMEAS S.A Papapanagiotou to the extent according paragraph 3 of this protocol.

2. Test sample

The test sample was applied by the TZÚS Praha, s.p. on 15/12/2016 and in Test Laboratory No. 1018.3 was recorded on 15/12/2016 under record number:

Sample	Laboratory Record Number	Declared th.
Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm)	VZ040163190/1	38 mm

3. Tests done

Date of installation of the samples: 15/12/2016
Testing date: 15/12/2016
The test has been carried out by: Lukáš Rulf
Tests Performed (general simplified name):

- determination of sound absorption capacity according to ČSN EN ISO 354:2003

Data declared by the manufacturer:
Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm)

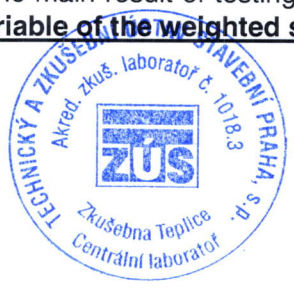
Preparation of samples and method of installation:
The sample was visually inspected upon acceptance, and its type checked according to the specification. The samples complied with the specification. The installation was done by the staff of TZÚS Praha, s.p.; the sample was applied to the rear section of the floor of chamber D1.
Data on sample composition were taken from the specification provided by the manufacturer. The mentioned technical parameters are intended for inspection and documentary purposes and are only informative in character.

Test reverberation rooms:
D1 (reverberation chamber TZÚS 2015)

Technical specification of the test:

Measurement was done in an anechoic chamber according to ČSN EN ISO 354. Measurement is done by omnidirectional impact of the sound waves on the sample and is based on measurement of the reverberation time of the empty chamber and the chamber containing the tested sample. The difference in measurements is used to specify the equivalent absorption area of the sample and the sound absorption coefficient α_s. The measurement was done in one third octave bands from 100 to 5000 Hz.

The results of the test are the values of sound absorption coefficient α_{si} in one third octave bands from 100 to 5000 Hz. The main result of testing that is objectively related to the tested structure is the **single digit variable of the weighted sound absorption α_w**.



The average reverberation time in the reverberant chamber is determined by measurement with a test sample installed and without a test sample. The equivalent absorption area A_1, in square metres, of an empty reverberant chamber is calculated using the formula:

$$A_1 = \frac{55{,}3V}{cT_1} - 4Vm_1$$

Where

V is the volume of the empty reverberant chamber in cubic metres;
c speed of sound transmission in the air in metres per second (for the usual laboratory temperatures in the range t = 15 °C to 30 °C, the value is calculated as c = 331+ 0.6t (m/s);
T_1 reverberation time, in seconds, of an empty reverberant chamber;
m_1 attenuation coefficient in air, in m^{-1}, calculated according to ISO 9613-1 with respect to climatic conditions that existed in the empty reverberant chamber during measurement.

Value m_1 can be calculated from the damping factor α, which is used in ISO 9613-1, according to the formula:

$$m = \frac{\alpha}{10 \lg(e)}$$

The equivalent absorption area A2, in square metres, of the reverberant chamber containing a test sample is calculated using the formula:

$$A_2 = \frac{55{,}3V}{cT_2} - 4Vm_2$$

Where

V and c have the same meaning as in the previous paragraph;

T_1 reverberation time, in seconds, of the reverberant chamber after the test sample has been placed;
m_2 attenuation coefficient in air, in m^{-1}, calculated according to ISO 9613-1 with respect to climatic conditions that existed in the reverberant chamber including the sample.

The equivalent absorption area A, in square metres, is calculated using the formula:

$$A_T = A_2 - A_1 = 55{,}3V\left(\frac{1}{c_2T_2} - \frac{1}{c_1T_1}\right) - 4V(m_2 - m_1)$$

Where

c_1 is the speed of sound propagation in air at temperature t_1;
c_2 for speed of sound propagation in air at temperature t_2;
A_1, V, T_1, m_1, A_2, T_2 and m_2 have the same meaning as in previous paragraphs.

The sound absorption coefficient α of the sample is calculated using the formula:

$$\alpha_s = \frac{A_T}{S}$$

Where

A_T is the equivalent absorption area A, in square metres
S is the area covered by the test sample in square metres

4. Standards applied

4.1 Testing standards

ČSN EN ISO 354:2003	Acoustics - Measurement of sound absorption in a reverberation room

4.2 Referenced standards

ČSN EN ISO 11654:1998	Acoustics - Sound absorbers for buildings - Assessment of sound absorption
VDI 3755:2015-01	Sound insulation and sound absorption

5. Measuring and other instruments used

- Norsonic type 118 – Integration sound-level meter of accuracy 1 complying with EC 60651, 60804, 61672-1, and 61260, primary memory for 2,500,000 data items. Serial number 31991, 8012-OL-10125-16 valid until: 28/03/2018
- Microphone Norsonic type 1225 and pre-amp type 1205, serial No. 72839, test sheet No. ... test sheet: 8012-OL-10128-16 valid until: 28/03/2018
- Norsonic acoustic calibrator, type 1251, serial No.: 31612. The meter complies with the requirements of the IEC 942, 8012-KL-10129-16 standard, valid until: 23/03/2018
- Thermometer and Hygrometer Testo 608-H1, serial number 445815, calibration certificate KLT-10K-886 effective until 7 November 2017.
- Digital barometer VOLTCRAFT DL180-THP, serial number 10052467, calibration certificate 1485/11 effective until 28 June 2017.
- Sound field excitation set, Norsonic hemisphere, type 250 (120 dB).

Instruments and measuring devices are validated according to the applicable metrological plan of the Teplice Test Facility.

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6. Test results

The test results are given in the annexes, applicable single-digit values and descriptions are given in table 1.

TABLE 1a Single-digit value and class according to ČSN EN ISO 11654:1998:

Property	Units	Class	Weighted sound absorprtion α_w. Verbal description VDI 3755:2015-01
Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm) VZ040163190/1	---	C	0.70 (MH) High absorptive

END OF THE REPORT

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Sound absorption coefficient according to ISO 11654

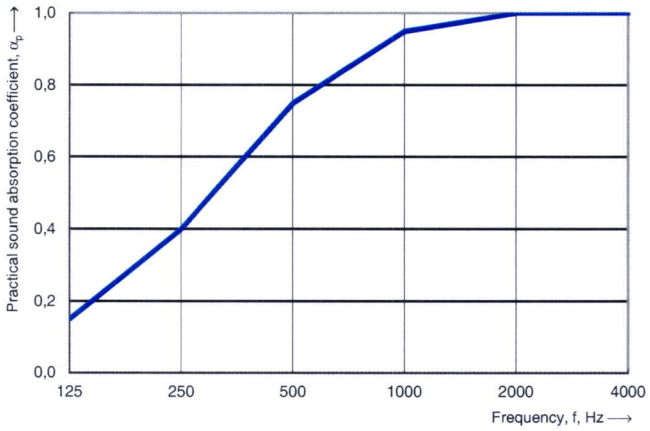
Measurement of sound absorption coefficient in a reverberation room

Client:	DROMEAS S.A Papapanagiotou, Industrial Area of Serres, Zip Code 62121, Greece	Date of test:	15.12.2016
Description:	Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm)		

Object: VZ040163190/1

		Empty reverberation room:		Reverberation room with object:	
Surface area:	12,00 m2	Relative humidity:	51,1 %	Relative humidity:	56,7 %
Reverberation room volume:	206,2 m3	Temperature:	16,8 °C	Temperature:	16,4 °C
		Barometric Pressure:	994 kPa	Barometric Pressure:	993 kPa

Frequency f [Hz]	α_p
125	0,15
250	0,40
500	0,75
1000	0,95
2000	1,00
4000	1,00



Weighted sound absorption coefficient according to ISO 11654

α_w = 0,70 (MH)

No. of test report: Annex no. 1, Protocol no. 040-053918

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Annex no. 2, Protocol nr. 040-053918

Evaluation according to EN ISO 11654

Acoustics - Sound absorbers for use in buildings - Rating of sound absorption and VDI 3755/2000

Sample	α_w	Class ČSN EN ISO 11654 --- VDI 3755/2000
Panel Core 0,7 foam15mm + melamine 8mm + foam 15mm with fabric B2L1 (38 mm)	**0,70 (MH)**	**C --- high absorptive**

Tab. 1 - α_w evaluation

Class	α_w	Description
EN ISO 11654		**VDI 3755/2000**
A	0,90; 0,95; 1,00	very high absorptive
B	0,80; 0,85	very high absorptive
C	**0,60; 0,65; 0,70; 0,75**	**high absorptive**
D	0,30; 0,35; 0,40;	absorptive
	0,45; 0,50; 0,55	
E	0,15; 0,20; 0,25	low absorptive
---	0,05; 0,10	reflective