MFPA Leipzig GmbH

Leipzig Institute for Materials Research and Testing

Testing, Inspection and Certification Authority for Construction Products and Constructions Types

Business Division II:
Load-Bearing Structures and Sound Insulation
Head of Division:
Prof. Dr.-Ing. Elke Reuschel
Tel.: +49 (0) 341-6582-143
Fax: +49 (0) 341-6582-181
tragwerke@mfpa-leipzig.de

Work Group 2.3
Sound Insulation

Contact Person:
Dipl.-Phys. Dietmar Sprinz
Tel.: +49 (0) 341-6582-115
d.sprinz@mfpa-leipzig.de

Dipl.-Ing. M. Busch
Tel.: +49 (0) 341-6582-163
m.busch@mfpa-leipzig.de

Testing laboratory accredited by DAkkS GmbH according to DIN EN ISO/IEC 17025.
Recognized Testing Laboratory by the VMPA

Acoustic Testing VMPA-SPG-129-97-SN

Test Report No. PB 2.3/23-025-4

- English version of test report No. PB 4.2/16-252-33 dated 25-09-2017 -

31 March 2023

No. Copy

Subject matter: Laboratory measurement of airborne sound insulation of a massive wood ceiling with an overlying impact-sound insulating mat *REGUPOL comfort 12* on a PUR bound compensating and sound insulating fill *REGUPOL comfort S1* under a dry screed (OSB) acc. to DIN EN ISO 10140

REGUPOL comfort S1 with variant rock granulation Diabas grit 2/5 mm

Client: REGUPOL BSW GmbH
Am Hilgenacker 24
57319 Bad Berleburg
Germany

Date of order: 13-02-2023

Date of test: 21-09-2017

Person in charge: Dipl.-Ing. M. Busch
Dipl.-Phys. D. Sprinz

This document consists of 8 pages and 2 annexes.

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1. Task specification

Airborne sound insulation of a massive wood ceiling with an overlying impact-sound insulating mat named *REGUPOL comfort 12* of the manufacturer

REGUPOL BSW GmbH
Am Hilgenacker 24
57319 Bad Berleburg
Germany,

on a PUR bound compensating and sound insulating fill *REGUPOL comfort S1*, has to be determined acc. to DIN EN ISO 10140-2 in the test bench of MFPA Leipzig GmbH. The test has to be performed with an applied dry screed of OSB boards on *REGUPOL comfort 12*.

In the present case, a rock granulation with designation Diabas grit 2/5 mm has to be used for compensating and sound insulating fill *REGUPOL comfort S1* as ordered.

2. Sampling, location and date of measurement

Massivwood ceiling (manufacturer Eugen Decker Holzindustrie KG) was delivered in the form of four prefabricated elements for mounting in test bench.

The following materials for floor setup of test object were provided:

- impact sound insulating mat *REGUPOL comfort 12*, in the form of long webs, 13 m length x 1150 mm wide x 4/12 mm thickness, profiled
- PUR bounding material *REGUPOL comfort 1* for compensating and sound insulating fill *REGUPOL comfort S1* of the BSW company
- mineralic rock granulation *REGUPOL comfort S* for compensating and sound insulating fill *REGUPOL comfort S1* of the BSW company
- roof underlayer Alujet Difujet, with adhesive tape
- edge insulation strip of mineral wool (20 mm thick)
- glass filament tape in roll form, self adhesive, 100 mm wide
- OSB boards, 22 mm thick, with system of groove and tongue

Massivwood ceiling was mounted by craftsmen of MFPA Leipzig in the test bench.
Installation of compensating and sound insulating fill on massivwood ceiling was made by client together with craftsmen of MFPA Leipzig. The material to be tested and the dry of OSB boards screed were laid on top of this by craftsmen of MFPA Leipzig.

Date of test is revealed on the cover sheet of this report. The setting time of the compensating and sound insulating fill *REGUPOL comfort S1* was 1 day.

3. Test object

REGUPOL comfort 12 is an impact sound insulation mat under floating screed, on underside profiled and made of rubber granules and polyurethane foam. As dry screed, one layer OSB boards (22 mm thick) was installed. Compensating and sound insulating fill *REGUPOL comfort S1* between top edge Massivwood ceiling and impact sound insulation mat was made of components *REGUPOL comfort S* (mineralic rock granulation) und *REGUPOL comfort 1* (bounding material). It is ready for covering after approx. 1 day according to the client.

Test setup of massivwood ceiling was described in test report PB 4.2/16-252-25 of MFPA Leipzig GmbH dated 08-08-2017.

Test object: (from top to bottom)

- 22 mm dry screed of 1 layer OSB boards (with system of groove and tongue)
- Alujet Difujet
- 12 mm impact sound insulation mat *REGUPOL comfort 12* (mass per unit area 3.0 kg/m², see result protocol for dynamic stiffness PB 4.2/16-252-4 dated 22-08-2016 der MFPA Leipzig GmbH), thickness 4/12 mm, profiled
- 100 mm[1] compensating and sound insulating fill *REGUPOL comfort S1*
- Alujet Difujet
- 160 mm massivwood raw ceiling

Following in the table stated dimensions, mass per unit area and raw density of dry screet components were detemined by testing institute.

Table 1: determined dimensions and mass per unit area and raw density

designation	length mm	wide mm	thickness mm	mass per unit area	raw density
OSB-board	2050	675	22	13,8 kg/m²	631 kg/m³

[1] Measured Thickness (Average Value) of compensating and sound insulating fill is shown under 7.2.

Assembly (s. annex 2):

Floor was installed on massivwood raw ceiling full-surface. The surrounding edge insulation strip on the flanking walls consisted of 20 mm thick mineral wool. Compensating and sound insulating fill *REGUPOL comfort S1* was put in place, after laying out of Alujet Difujet for protecting the massivwood raw ceiling. Impact sound insulation mats *REGUPOL comfort 12* were installed in one layer on hardened Compensating and sound insulating fill, with the profiled side down. The butt joints of the impact sound insulation mats were all fixed in position on the top side with standard adhesive tape. The layer of impact sound insulation mats was covered with Alujet Difujet on the top side. Finally, the dry screed of 1 layer OSB boards (22 mm thick), with system of groove and tongue, was mounted.

4. Testing room

Testing room for ceilings complies with requirements imposed by DIN EN ISO 10140-5. The source room is enclosed by of plasterboard stud walls. The reveiving room has enclosing walls of 24 cm sand-lime brick masonry, raw density class 1.8. Source room and receiving room have rectangular geometry. For reduction of flanking transmission, Source room is elastically supported on receiving room. Additionally, a floating screed is mounted in receiving room for the reduction of flanking transmission.

A circumferential reinforced concrete ring beam, with console with 19.5 cm wide, overlies on top edge of sand-lime brick masonry of receiving room for supporting the test object.

Size of test opening was 18.0 m² (4.75 m length x 3.79 m wide).

The room volumes of the source- and receiving room are shown in Annex 1. The air temperatures and relative humidities in the test rooms as well as the static pressure at the time of measurement are also shown in Annex 1.

5. Test method

The measurements of the airborne sound insulation were carried out according to:

- DIN EN ISO 10140-2, Acoustic, Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation, issue December 2010

The calculation of the airborne sound insulation (rated sound reduction index R_w) was carried out according to:

- DIN EN ISO 717-1, Acoustic, Rating of sound insulation in buildings and of building elements, Part 1: airborne sound insulation, issue June 2013

The sound reduction index R was determined by pink wide band noise for each average frequency of 50 – 5000 Hz across the test area provided.
The sound reduction index R results from the following equation:

$$R = L_1 - L_2 + 10 \lg (S/A) \text{ in dB}$$

where:

L_1 mean sound pressure level in source room in dB
L_2 mean sound pressure level in receiving room in dB
S size of test opening in m²
A equivalent absorption area in receiving room in m²

The equivalent absorption area in receiving room was determined from 12 measurements of the reverberation time in the third octave bands by the following equation:

$$A = 0.16 \times V/T$$

where:

V volume of the receiving room in m³
T reverberation time in receiving room in s

Procedure and volume of measurements are in accordance with the principles of the research group of the building authorized acoustic noise laboratories.

In the 1/3 octave band 5000 Hz was the measurement limit reached because the high airborne sound insulation of test object. That means, the considered R value in this 1/3 octave band frequency is a minimal value (real value equal high or higher).

6. Measuring instruments

The following listed measuring devices were used.

Table 2: Measuring devices

Device	Type	Manufacturer
Real time analyser with noise generator	840	Norsonic
Free field microphone	1220	Norsonic
Preamplifier	1201	Norsonic
Calibrator	4231	B & K
Power amplifier	260	Norsonic
Speaker combination (Dodekaeder)	229	Norsonic
Mikrophone panning system	231, 252, 253	Norsonic

Measuring instruments are calibrated regularly, and the measurement chain is calibrated before and after each measurement. MFPA Leipzig regularly takes part in the comparative measurements for Group 1 testing laboratories (qualification testing laboratories) of the Physikalisch Technischen Bundesanstalt (PTB = German national metrology institute) Braunschweig (the last one being in 2016) and registered as a testing laboratory in the “List of testing, monitoring and certifying laboratories in accordance with the state building codes” of the Deutschen Institutes für Bautechnik DIBt (German Institute for Construction Technology) under the code number “SAC 02”.

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7. Measuring results

7.1 Airborne sound insulation

The rated sound reduction index R_w in accordance with DIN EN ISO 717-1 determined and evaluated is given for the frequency range from 100 to 3150 Hz including the spectrum adaptation values C and C_{tr} in following table.

Table 3: Test results of airborne sound insulation

Test object	**rated sound reduction index**	**spectrum adaptation values [dB]**						**see Annex 1**
	test result R_w (C; C_{tr}) [dB]	$C_{50-3150}$	$C_{50-5000}$	$C_{100-5000}$	$C_{tr,50-3150}$	$C_{tr,50-5000}$	$C_{tr,100-5000}$	
22 mm OSB boards Alujet Difujet 12 mm impact sound insulation mat *REGUPOL comfort 12* compensating and sound insulating fill *REGUPOL comfort S1* Alujet Difujet massivwood raw ceiling	**70 (-5 ; -13)**	-10	-9	-4	-23	-23	-13	1

For graphical and tabular representation of R values depending on the frequency please refer to Annex 1.

7.2 Thickness and mass per unit area of screed

Compensating and sound insulating fill:

- Arithmetic mean of thickness: 101 mm
- Mass per unit area: 162 kg/m²

The respective arithmetic mean of thickness was determined on 10 dots of compensating and sound insulating fill. The mass per unit area was determined by weighting the whole demolition waste from compensating and sound insulating fill.

During demolition, it was found that within some partial areas, the PUR binder had not firmly bonded the aggregates in the thickness range of approx. 1 - 2 cm from the lower edge of the compensating and sound insulating fill.

8. Notes on the test results

The result R_w is a value determined in the laboratory for the rated sound reduction index.

The results of the tests exclusively relate to the items tested. This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 31 March 2023

Dipl.-Phys. D. Sprinz
Head of Work Group

Dipl.-Ing. M. Busch
Testing Engineer

Sound reduction index according to ISO 10140-2

Laboratory measurements of airborne sound insulation of building elements

Client / Manufacturer: REGUPOL BSW GmbH, Am Hilgenacker 24, 57319 Bad Berleburg, Germany Date of test:21-09-2017

Test object installed by: Client / MFPA Leipzig Marking of testing rooms: BD.02 / BD.01

Product: dry screed (OSB) on impact sound insulation mat *REGUPOL comfort 12* and compensating and sound insulating fill *REGUPOL comfort S1* (with rock granulation with designation Diabas grit 2/5 mm) on massivwood raw ceiling

Setup of test object:

- 22 mm	dry screed of 1 layer OSB boards (with system of groove and tongue)
-	Alujet Difujet
- 12 mm	impact sound insulation mat REGUPOL comfort 12, thickness 4/12 mm, profiled
- 100 mm	compensating and sound insulating fill REGUPOL comfort S1
-	Alujet Difujet
- 160 mm	massivwood raw ceiling

Mass per unit area: approx. 77 kg/m² (massivwood raw ceiling) plus approx. 179 kg/m² (floor setup)

Size of test opening: 18.0 m²

Temperature SR / RR: 22 / 22 °C

Rel. Humidity SR / RR: 45 / 45 %

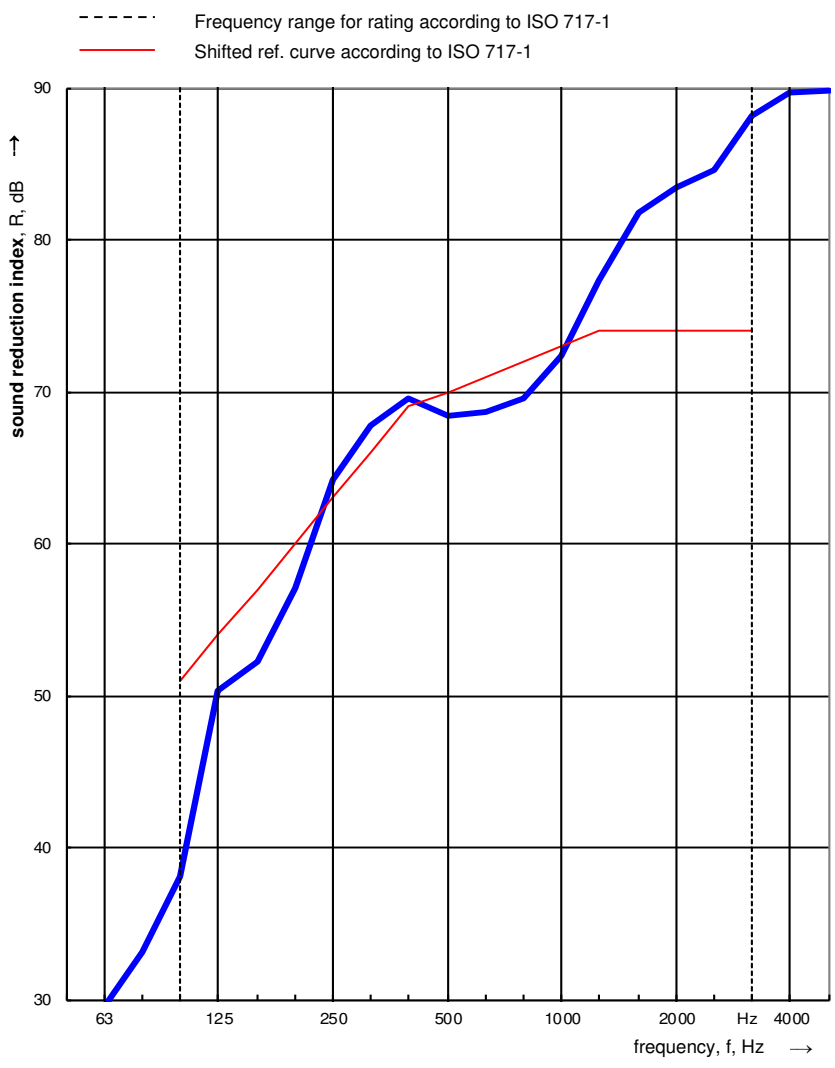
Static pressure: 100 kPa

Volume SR / RR: 55.5 / 61.2 m³

(SR = Sourceroom; RR = Receivingroom)

frequency f [Hz]	R 1/3 octave [dB]
50	25,5
63	29,6
80	33,1
100	38,1
125	50,3
160	52,2
200	57,1
250	64,2
315	67,8
400	69,6
500	68,4
630	68,7
800	69,6
1000	72,3
1250	77,3
1600	81,8
2000	83,4
2500	84,6
3150	88,2
4000	89,7
5000	89,8 [1]

[1] background noise level too high



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 70 (-5 ; -13) dB$

These results are based on test made under laboratory conditions obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150} =$ -10 dB $C_{50\text{-}5000} =$ -9 dB $C_{100\text{-}5000} =$ -4 dB

$C_{tr,50\text{-}3150} =$ -23 dB $C_{tr,50\text{-}5000} =$ -23 dB $C_{tr,100\text{-}5000} =$ -13 dB

MFPA
Bereich Schallschutz
Hans-Weigel-Str. 2b
04319 Leipzig
Tel. 0341- 6582115

Signature:

a)  b) 

Figure A 2.1: Massivholz-Rohdecke a) top side, before installtion of floor setup, b) bottom side

Figure A 2.2: situation during mounting - installtion of floor compensating and sound insulating fill

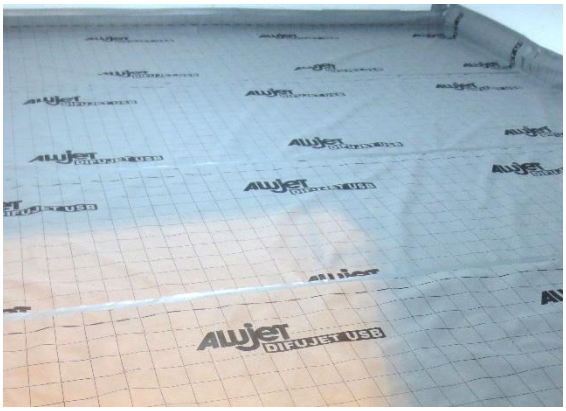
a)  b) 

Figure A 2.3: situation during mounting a) laying out of impact sound insulation mats on hardened Compensating and sound insulating fill, butt joints with adhesive tape, b) after laying on of Alujet Difujet

Figure A 2.4: situation during mounting - dry screed

Figure A 2.5: dry screed (situation of test)