

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 2.3/23-025-2

- English version of test report No. PB 4.2/16-252-31 dated 28-08-2017 -

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 cement screed acc. to DIN EN ISO 10140
REGUPOL comfort S1 with variant rock granulation Rhyolith 2/8

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

Date of order: 13-02-2023

Date of test: 23-08-2017

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

This document consists of 8 pages and 2 annexes.

This document may only be reproduced in its unabbreviated form. All publication, even in excerpts, requires the prior written permission of MFPA Leipzig GmbH. The legal binding form is the written German form with the original signatures and original stamp of the authorized signatory / signatories. General terms and conditions of MFPA Leipzig GmbH are valid.

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 cement screed on *REGUPOL comfort 12*.

In the present case, a rock granulation with designation Rhyolit 2/8 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
- cement screed

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 cement 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 and of the cement screed 21 days.

3. Test object

REGUPOL comfort 12 is an impact sound insulation mat under floating screed (cement screed), on underside profiled and made of rubber granules and polyurethane foam. 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)

- 45 mm cement screed
- 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 mm¹ compensating and sound insulating fill *REGUPOL comfort S1*
- Alujet Difujet
- 160 mm massivwood raw ceiling

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 cement screed was mounted.

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

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 receiving 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 m^2

A equivalent absorption area in receiving room in m^2

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 m^3

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.

6. Measuring instruments

The following listed measuring devices were used.

Table 1: 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. MFA 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”.

MFA Leipzig is a testing laboratory accredited by DAkkS GmbH according to DIN EN ISO/IEC 17025.

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 2: 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]	$C_{50-3150}$	$C_{50-5000}$	$C_{100-5000}$	$C_{tr,50-3150}$	$C_{tr,50-5000}$	$C_{tr,100-5000}$	
45 mm cement screed Alujet Difujet 12 mm impact sound insulation mat <i>REGUPOL comfort 12</i> compensating and sound insulating fill <i>REGUPOL comfort S1</i> Alujet Difujet massivwood raw ceiling	70 (-2 ; -8)	-5	-4	-1	-17	-17	-8	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

Cement screed:

- Arithmetic mean of thickness: 47 mm
- Mass per unit area: 91 kg/m²

Compensating and sound insulating fill:

- Arithmetic mean of thickness: 98 mm
- Mass per unit area: 148 kg/m²

The respective arithmetic mean of thickness was determined on 10 dots of screed area respectively on 10 dots of compensating and sound insulating fill. The respective mass per unit area was determined by weighting the whole demolition waste from cement screed respectively from 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: 23-08-2017

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

Product: cement screed on impact sound insulation mat *REGUPOL comfort 12* and compensating and sound insulating fill *REGUPOL comfort S1* (with rock granulation with designation Rhyolit 2/8) on massivwood raw ceiling

Setup of test object:

- 45 mm cement screed
- 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 Difujetn
- 160 mm massivwood raw ceiling

Mass per unit area: approx. 77 kg/m² (massivwood raw ceiling) plus approx. 242 kg/m² (floor setup)

Size of test opening: 18.0 m²

Temperature SR / RR: 22 / 22 °C

Rel. Humidity SR / RR: 45 / 46 %

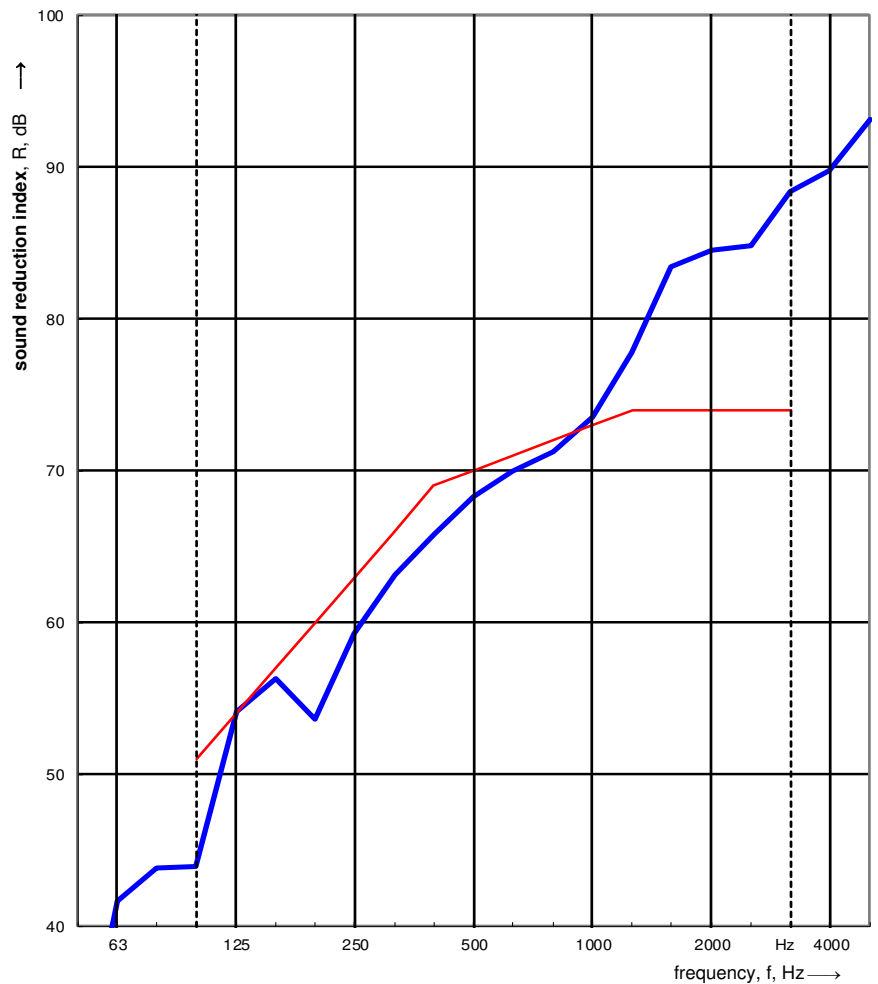
Static pressure: 100 kPa

Volume SR / RR: 54.8 / 61.2 m³

(SR = Sourceroom; RR = Receivingroom)

----- Frequency range for rating according to ISO 717-1
 ———— Shifted ref. curve according to ISO 717-1

frequency f [Hz]	R 1/3 octave [dB]
50	29,0
63	41,7
80	43,8
100	43,9
125	54,1
160	56,3
200	53,6
250	59,3
315	63,1
400	65,8
500	68,3
630	70,0
800	71,3
1000	73,5
1250	77,8
1600	83,5
2000	84,5
2500	84,8
3150	88,4
4000	89,8
5000	93,2



Rating according to ISO 717-1

$R_w(C;C_{tr}) = 70 (-2 ; -8) \text{ dB}$

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

$C_{50-3150} = -5 \text{ dB}$ $C_{50-5000} = -4 \text{ dB}$ $C_{100-5000} = -1 \text{ dB}$
 $C_{tr,50-3150} = -17 \text{ dB}$ $C_{tr,50-5000} = -17 \text{ dB}$ $C_{tr,100-5000} = -8 \text{ dB}$

Signature:

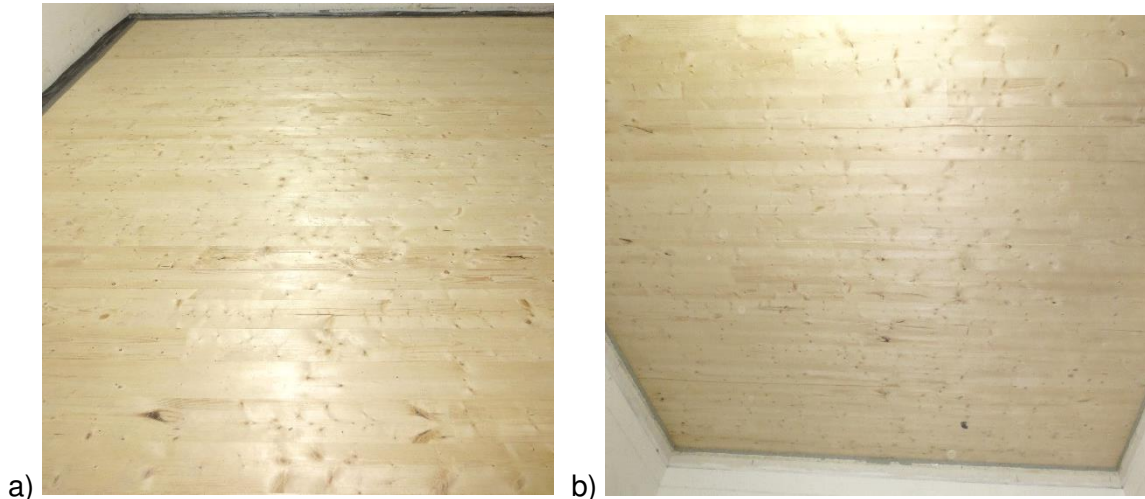


Figure A 2.1: Massivholz-Rohdecke a) top side, before installation of floor setup, b) bottom side
 "←" Measuring limit



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

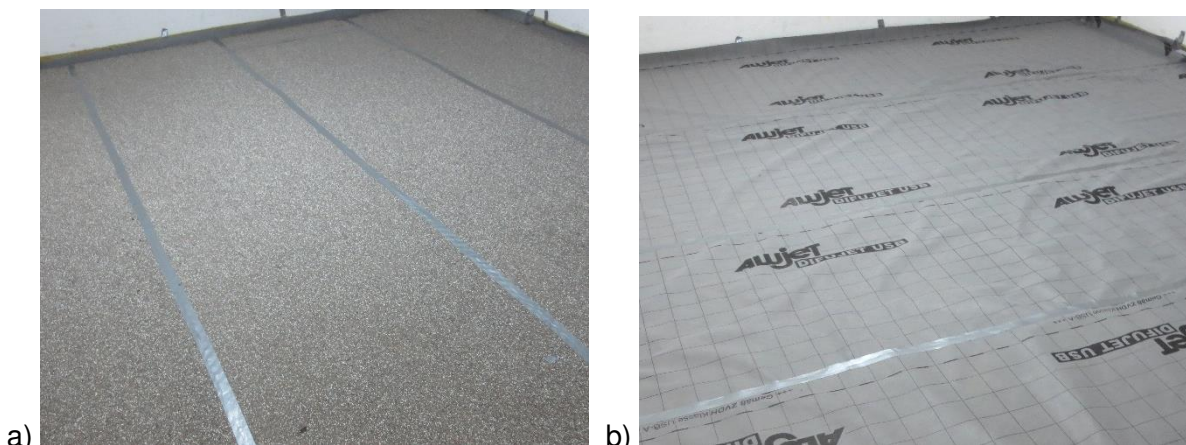


Figure A 2.3: situation during mounting a) laying out of impact sound insulation mats on hardened Compensating and sound insulating fill, butt joints with adhesive tape, b) after laying on of Alujet Difujet



Figure A 2.4: situation during mounting - cement screed



Figure A 2.5: cement screed (situation of test)