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Raumakustik · Bauphysik
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Messstelle nach § 29b
Bundes-Immissionsschutzgesetz

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TEST CERTIFICATE

• Determination of sound insulation R_w in accordance with DIN EN ISO 140-3 / 717-1 •

Test object:	Influence of switch and socket boxes (cavity wall boxes) integrated in lightweight walls on sound insulation
Applicant:	Kaiser GmbH & Co. KG Ramsloh 4 58579 Schalksmühle
Test certificate no.:	A8690-I
Drawn up on:	05 May 2019

VMPA SCHALLSCHUTZPRÜFSTELLE NACH DIN 4109

(GRANER+PARTNER) (head of testing centre) (measurement engineer)

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Appendices

Evaluation diagrams for constructional sound reduction indices

1. General provisions

The sound reduction index of the test material is determined in accordance with

DIN EN ISO 140 / 717.

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Revocation of test certificate

The test certificate may be revoked by G + P if the conditions for its issue are no longer fulfilled. This applies in particular if materials or structural designs have been altered, so that the product no longer corresponds to the version tested.

2. System description of test material / test set-up

The aim of the examinations conducted here was to ascertain the extent to which cavity wall boxes designed to accommodate light switches, sockets and other similar devices installed in lightweight partition walls compromise the sound insulation of those walls.

To this end, a lightweight wall with a metal frame was installed in the test stand for constructional acoustics.

Structure of lightweight wall

- fireproof gypsum plasterboard panelling, 2 x 12.5 mm on CW 50 metal frame
- mineral fibre insulating material packed into frame, thickness 2 x 40 mm
- ventilation space
- frame and panelling as above
- overall structure approx. 470 mm

In the first stage, the sound insulation of the construction was measured.

Following that, the switch and socket boxes were installed in pairs in the partition wall, each box in a pair being placed directly opposite the other. The insulating material in the wall cavity between the switch and socket boxes was completely removed. Empty conduit with cables was introduced into each box. The conduit was closed off by means of a plug. The boxes were equipped with devices or fitted with a cover plate.

3. Sound insulation test

The size of the test surface, i.e. the area of the partition wall element, was 11.7 m^2. In the evaluation of the constructional sound reduction indices, the sound insulation was determined with reference to this test surface.

The following individual measurements were carried out:

- measurement of the sound insulation of the lightweight wall element without any installations

- measurement of the sound insulation after the integration of 9 installations as follows:

  - 3 x fivefold combination with device
  - 3 x single box with device
  - 3 x single box with cover

  each member of a pair being directly opposite the other.

  Between the boxes the insulating material was completely removed, and the boxes were connected up with one another using empty conduit with cables inserted.

  The following switch and socket boxes were used:

  - Electronic-Boxes soundproof 68 flex, item number 9069-94
  - Socket boxes soundproof 68, item number 9069-04
  - Device boxes soundproof 68, item number 9069-03

4. Measurement technique

Instrument	Manufacturer	Type	Serial-number	Calibrated until end of
soundanalyser	Norsonic	NOR 140	1404720	2020
soundanalyser	Norsonic	NOR 140	1404721	2020
preamplifier A	Norsonic	1/2" preamplifier, Typ 1209	13989	2020
preamplifier B	Norsonic	1/2" preamplifier, Typ 1209	14125	2020
preamplifier		MV203	0629	2020
loudspeaker	Norsonic	213	796	
Amplifier	Norsonic	235	16661	

5. Measurement and analysis specifications

DIN EN ISO 10140:
Measurement of sound insulation of building elements on a test stand

DIN EN ISO 717-1:
Rating of sound insulation in buildings and of building elements –
Part 1: Airborne sound insulation

The test sound used was noise, filtered by means of third-octave filters on the transmission and receiving sides in accordance with DIN 45652.

The measurements were carried out with 2 loudspeakers and 2 positions each on the microphone swivel unit (4 measurement sequences each on both the transmission and the receiving side).

The sound reduction index is calculated from the measurement values as follows:

$R` = L_1 - L_2 + 10 \log S/A, \quad A = 0.16 * V/T$

Key to symbols used in formula:

R`	=	sound reduction index as per DIN EN ISO 140
L_1	=	sound pressure level in transmission room
L_2	=	sound pressure level in receiving room
S	=	surface area of test wall
A	=	equivalent sound absorption surface area of transmission room, determined from measurements of reverberation time
V	=	volume of receiving room
T	=	reverberation time in receiving room

6. Measurement results

The measurements thus carried out resulted in the following single sound insulation values (see also Appendices 1 - 2):

Appendix 1	Sound insulation of partition wall element without fittings	R_w = 68 dB
Appendix 2	Sound reduction index with fittings See result diagram ➢ 3 x fivefold combination with device ➢ 3 x single box with device ➢ 3 x single box with cover Each member of a pair being directly opposite the other	R_w = 68 dB

These single values are already enough to show that the installation of the combined wall and joint boxes does not cause any weakening of the wall construction in terms of its constructional acoustics. It can, moreover, also be seen from the comparative diagram in Appendix 3 that no relevant weakening occurs in individual frequency ranges either.

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Sound reduction Index, R, as per ISO 10140-2

Measurement of the sound insulation of componenst in the test bench

appendix	1
0rder no.:	A8690
test date	08.05.2019

client
Kaiser GmbH & Co. KG
Ramsloh 4, 58579 Schalksmühle

object:
one-gang- and junction-boxes
Item numbers: 9068-94; 9069-04; 9069-03
construction:
partition wall element
seperated metal frame, 2 x CW50,
mineral fibre insulating material 2 x 40 mm,
paneling on both sides:
2 x 12,5 mm Knauf fireproof gypsum board

measurement still without fittings

transmitti	Condition	
	Type	Laboratory 1
	Location	groundfloor
receiving	Condition	
	Type	Laboratory 2
	Location	groundfloor
surface area of element		11,7 m²
volume of transmitting room		53,1 m³
volume of receiving room		61,7 m³

Freq.: [Hz]	R [dB]	shifted reference curve
50	38,6	
63	38,5	
80	33,3	
100	42,1	49,0
125	48,3	52,0
160	51,7	55,0
200	53,7	58,0
250	58,6	61,0
315	61,5	64,0
400	61,7	67,0
500	66,1	68,0
630	70,1	69,0
800	70,9	70,0
1000	74,3	71,0
1250	79,5	72,0
1600	85,5	72,0
2000	87,8	72,0
2500	79,3	72,0
3150	75,2	72,0
4000	80,4	
5000	83,5	

Evaluation as per ISO 717-1

R (C,C_{tr}) = 68 (-2;-8) dB

$C_{50-3150}$	=	-5 dB	$C_{50-5000}$	=	-4 dB	$C_{100-5000}$	=	-1 dB
$C_{tr50-3150}$	=	-15 dB	$C_{tr50-5000}$	=	-15 dB	$C_{tr100-5000}$	=	-8 dB

VMPA - recognized sound insulation testing authority as per DIN 4109
Test centre as per § 29b BImSchG

Datum: 09.05.2019 compiled by Dipl. Ing. U. Gräf

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Sound reduction Index, R, as per ISO 10140-2

Measurement of the sound insulation of componenst in the test bench

appendix	2
0rder no.:	A8690
test date	08.05.2019

Client
Kaiser GmbH & Co. KG
Ramsloh 4, 58579 Schalksmühle

object:
one-gang- and junction-boxes
Item numbers: 9068-94; 9069-04; 9069-03

construction:
partition wall element
seperated metal frame, 2 x CW50,
mineral fibre insulating material 2 x 40 mm,
paneling on both sides:
2 x 12,5 mm Knauf fireproof gypsum board
boxes on source side
3 x 9068-94 with cover, 3 x 9068-94 with device
3 x fivefold combination, outer boxes 2 x 9068-94, inner boxes 3 x 9069-04
boxes on receive side
3 x 9068-94 with cover, 3 x 9068-94 with device
3 x fivefold combination, outer boxes 2 x 9068-94, inner boxes 3 x 9069-03
in each case opposing, with cable entries

integrated boxes:
Electronic box soundproof 68 flex, item number 9068-94
junction box soundproof 68, item number 9069-04
one-gang box soundproof 68, item number 9069-03

transmitti	Condition	
	Type	Laboratory 1
	Location	groundfloor
receiving	Condition	
	Type	Laboratory 2
	Location	groundfloor
surface area of element		11,7 m²
volume of transmitting room		53,1 m³
volume of receiving room		61,7 m³

Freq.: [Hz]	R [dB]	shifted reference curve
50	40,3	
63	40,7	
80	32,8	
100	44,2	49,0
125	48,4	52,0
160	53,4	55,0
200	54,9	58,0
250	57,2	61,0
315	61,4	64,0
400	59,8	67,0
500	63,9	68,0
630	69,1	69,0
800	72,5	70,0
1000	75,3	71,0
1250	79,6	72,0
1600	84,8	72,0
2000	86,4	72,0
2500	79,5	72,0
3150	75,2	72,0
4000	81,9	
5000	85,8	

Evaluation as per ISO 717-1

R (C,C_{tr}) = 68 (-2;-7) dB

$C_{50-3150}$	=	-5 dB	$C_{50-5000}$	=	-4 dB	$C_{100-5000}$	=	-1 dB
$C_{tr50-3150}$	=	-15 dB	$C_{tr50-5000}$	=	-15 dB	$C_{tr100-5000}$	=	-7 dB

VMPA - recognized sound insulation testing authority as per DIN 4109
Test centre as per § 29b BImSchG

Datum: 09.05.2019 compiled by Dipl. Ing. U. Gräf

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comparitiv diagram of sound reduction index

appendix:	3
Order no.:	A8690
date of test	08.05.2019

client **Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle**

Object:

one-gang- and junction-boxes
item numbers 9068-94; 9069-04; 9069-03

comparitiv diagram
with and without fittings

Freq.: [Hz]	line 1	line 2
50	38,6	40,3
63	38,5	40,7
80	33,3	32,8
100	42,1	44,2
125	48,3	48,4
160	51,7	53,4
200	53,7	54,9
250	58,6	57,2
315	61,5	61,4
400	61,7	59,7
500	66,1	63,9
630	70,1	69,1
800	70,9	72,5
1000	74,3	75,3
1250	79,5	79,6
1600	85,5	84,8
2000	87,8	86,4
2500	79,3	79,5
3150	75,2	75,2
4000	80,4	81,9
5000	83,5	85,8

line 1: **partition wall element without fittings, 68 dB**
Line 2: **with fittings, 68 dB**