GRANER+PARTNER
INGENIEURE

Raumakustik · Bauphysik
Medientechnik · Schallschutz
VMPA Schallschutzprüfstelle nach DIN 4109
Messstelle nach § 29b
Bundes-Immissionsschutzgesetz

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Amtsgericht Köln • HRB 45768
Ru A0388-II-1310

Gräf (Cert. Eng.), extension: -18

13.Okt.2010

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.:	A0388 - II
Drawn up on:	13 Oktober 2010

VMPA SCHALLSCHUTZPRÜFSTELLE NACH DIN 4109

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

Contents

Appendices

1. General provisions

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

DIN EN ISO 140 / 717.

Graner + Partner (G + P) is entitled to publish the test certificate. This also applies to any translation of the certificate into another language. Reproduction by the client is permissible. Transmission to a third party or parties is restricted to either the title page alone or the entire test certificate. No individual parts of the certificate may be passed on. If the test certificate is to be used for advertising purposes or publications, G + P will receive a specimen copy.

The test certificate will remain valid for as long as the manufacturer guarantees continued use of the materials tested with the same properties and structures.

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

- gypsum plasterboard panelling, Knauf, 12.5 mm silent board, 12.5 mm diamant, 12.5 mm silent bard, on CW 100 metal frame
- mineral fibre insulating material packed into frame, thickness 80 mm
- ventilation space
- frame and panelling as above
- overall structure approx. 485 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 installations as follows:

  - 3 x fire protection box HWD 90, type 9464-01, with fire protection cover plate type 1184-01
  - as above, but with device
  - as above, but with 3 x fivefold combination with device, type 9464-01

  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.

4. Measurement technique

Cortex Instruments	Spectrum Analyser, Type NC10 Free-field microphone 221 Pre-amplifier MV203
Norsonic	Amplifier, Type 235
Behr & Obermeyer	Loudspeakers

5. Measurement and analysis specifications

DIN EN ISO 140:
Measurement of sound insulation in buildings and of building elements
Part 3: Laboratory measurement of airborn sound insulation of elements

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 = 77 dB
Appendix 2	Sound reduction index with fittings 3 x fire protection box HWD 90, type 9464-01 with fire protection cover plate type 1184-01 Each member of a pair being directly opposite the other	R_w = 77 dB
Appendix 3	as above but with devices	R_w = 77 dB
Appendix 4	As above, but 3 x fivefold combination with devices	R_w = 77 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 5 that no relevant weakening occurs in individual frequency ranges either.

Sound reduction index, as per ISO 140-3: 1995

Appendix:	1
Order no.:	A0388
client: Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	Test date: 24.08.2010

Objekt:

sound insulation and fire protection boxes
Kaiser GmbH
device connection Boxes

Structure:

Lightweight partition wall, separate framework 2 x CW100
Planking on both sides made of Knauf gypsum boerds
Each structure:
12,5 mm silent board, 12,5 mm diamant, 12,5 mm silent board
ventilation space with mineral fibre insulating material
Knauf TP115 2 x 80 mm, overall structure approx. 485 mm

Conditions

Base wall without boxes

transmit
volume V = 53,6/61,7 m³

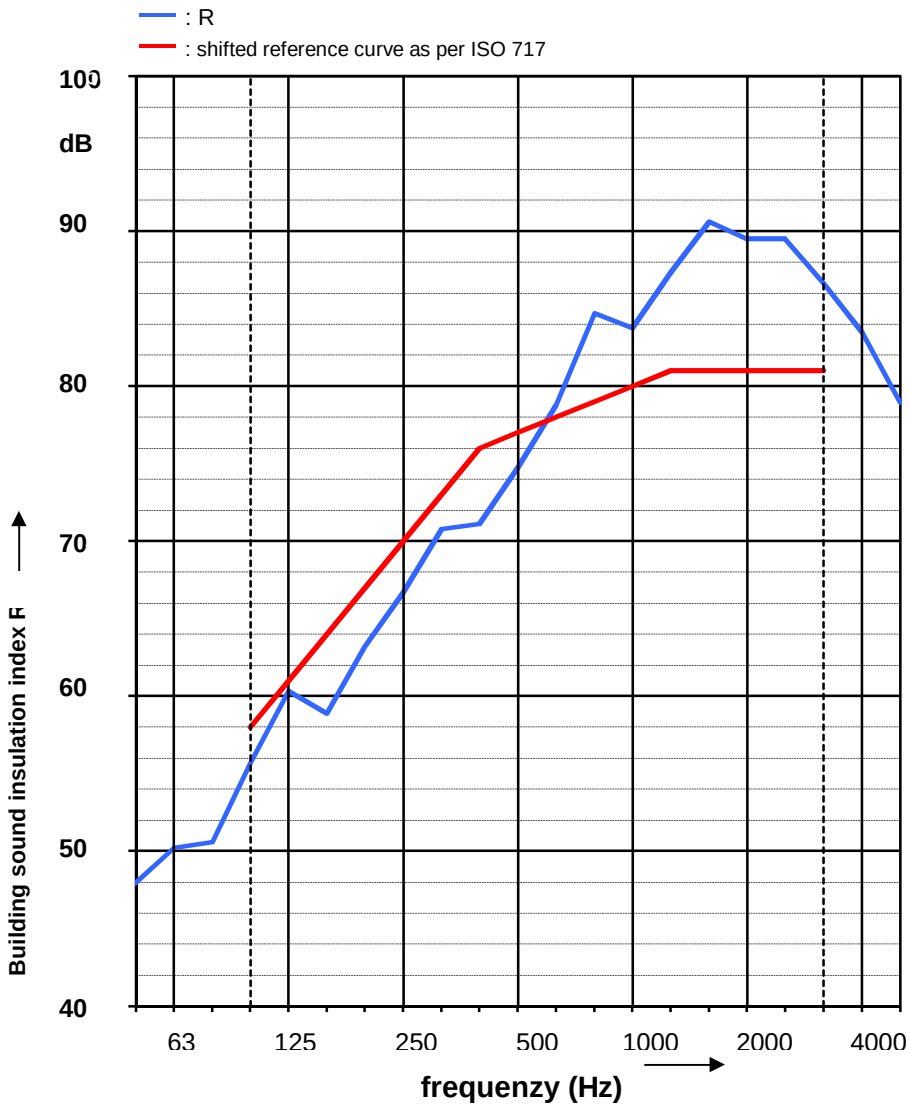
Type: laboratory 1 / laboratory 2
Location: Ground floor

receive
volume V = 61,7/53,6 m³

Type: Laboratory 2 / Laboratory 1
Location: Ground floor

surface area: 11,7 m²

Freq.: [Hz]	R´ [dB]	shifted reference curve
50	48,0	
63	50,2	
80	50,6	
100	55,7	58,0
125	60,4	61,0
160	58,9	64,0
200	63,2	67,0
250	66,7	70,0
315	70,8	73,0
400	71,1	76,0
500	74,8	77,0
630	78,8	78,0
800	84,7	79,0
1000	83,8	80,0
1250	87,4	81,0
1600	90,6	81,0
2000	89,5	81,0
2500	89,5	81,0
3150	86,7	81,0
4000	83,5	
5000	79,0	



Evaluation as per ISO 717-1

R'_w (C,C_{tr}) = 77 (-1;-6) dB

$C_{50-3150}$	=	-2	dB	$C_{50-5000}$	=	-2	dB	$C_{100-5000}$	=	-1	dB
$C_{tr50-3150}$	=	-11	dB	$C_{tr50-5000}$	=	-11	dB	$C_{tr100-5000}$	=	-6	dB

VMPA - recognized sound insulation testing authority as per DIN 4109
Test centre as per §§ 26, 28 BImSchG
(German Federal Immission Control)

date: 30.08.2010 Compiled by: Dipl. Ing. U. Gräf

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Sound reduction index, as per ISO 140-3: 1995

Appendix:	2
Order no.:	A0388
client: Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	Test date: 24.08.2010

Objekt:

sound insulation and fire protection boxes
Kaiser GmbH
device connection Boxes

Conditions

transmit
volume V = 53,6/61,7 m³

Type: laboratory 1 / laboratory 2
Location: Ground floor

receive
volume V = 61,7/53,6 m³

Type: Laboratory 2 / Laboratory 1
Location: Ground floor

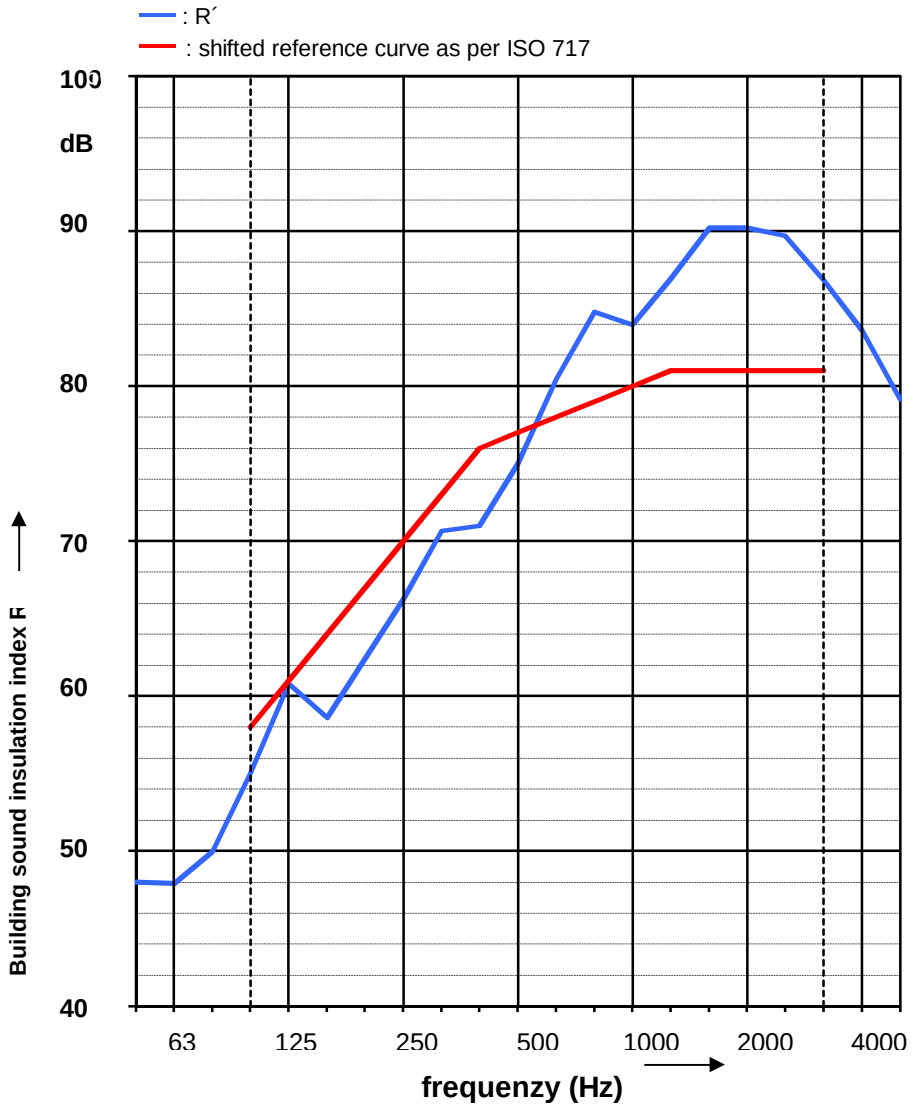
surface area: 11,7 m²

Aufbau des Prüfgegenstandes

Lightweight partition wall, separate framework 2 x CW100
Planking on both sides made of Knauf gypsum boerds
Each structure:
12,5 mm silent board, 12,5 mm diamant, 12,5 mm silent board
ventilation space with mineral fibre insulating material
Knauf TP115 2 x 80 mm, overall structure approx. 485 mm

with 3 x fire protection box HWD90, Typ 9464-01
each member of a pair being directly opposite the other
with fire protection cover plate type 1184-01 and cables inserted

Freq.: [Hz]	R´ [dB]	shifted reference curve
50	48,0	
63	47,9	
80	50,0	
100	55,0	58,0
125	60,8	61,0
160	58,6	64,0
200	62,4	67,0
250	66,3	70,0
315	70,7	73,0
400	71,0	76,0
500	75,0	77,0
630	80,5	78,0
800	84,8	79,0
1000	84,0	80,0
1250	87,0	81,0
1600	90,2	81,0
2000	90,2	81,0
2500	89,7	81,0
3150	86,9	81,0
4000	83,6	
5000	79,2	



Evaluation as per ISO 717-1

R'_w (C,C_{tr}) = 77 (-2;-7) dB

$C_{50-3150}$	=	-3	dB	$C_{50-5000}$	=	-2	dB	$C_{100-5000}$	=	-1	dB
$C_{tr50-3150}$	=	-12	dB	$C_{tr50-5000}$	=	-12	dB	$C_{tr100-5000}$	=	-7	dB

VMPA - recognized sound insulation testing authority as per DIN 4109
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date: 30.08.2010 Compiled by: Dipl. Ing. U. Gräf

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51465 Bergisch Gladbach

Sound reduction index, as per ISO 140-3: 1995

Appendix:	3
Order no.:	A0388
client: Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	Test date: 24.08.2010

Objekt:

sound insulation and fire protection boxes
Kaiser GmbH
device connection Boxes

Conditions

transmit
volume V = 53,6/61,7 m³

Type: laboratory 1 / laboratory 2
Location: Ground floor

receive
volume V = 61,7/53,6 m³

Type: Laboratory 2 / Laboratory 1
Location: Ground floor

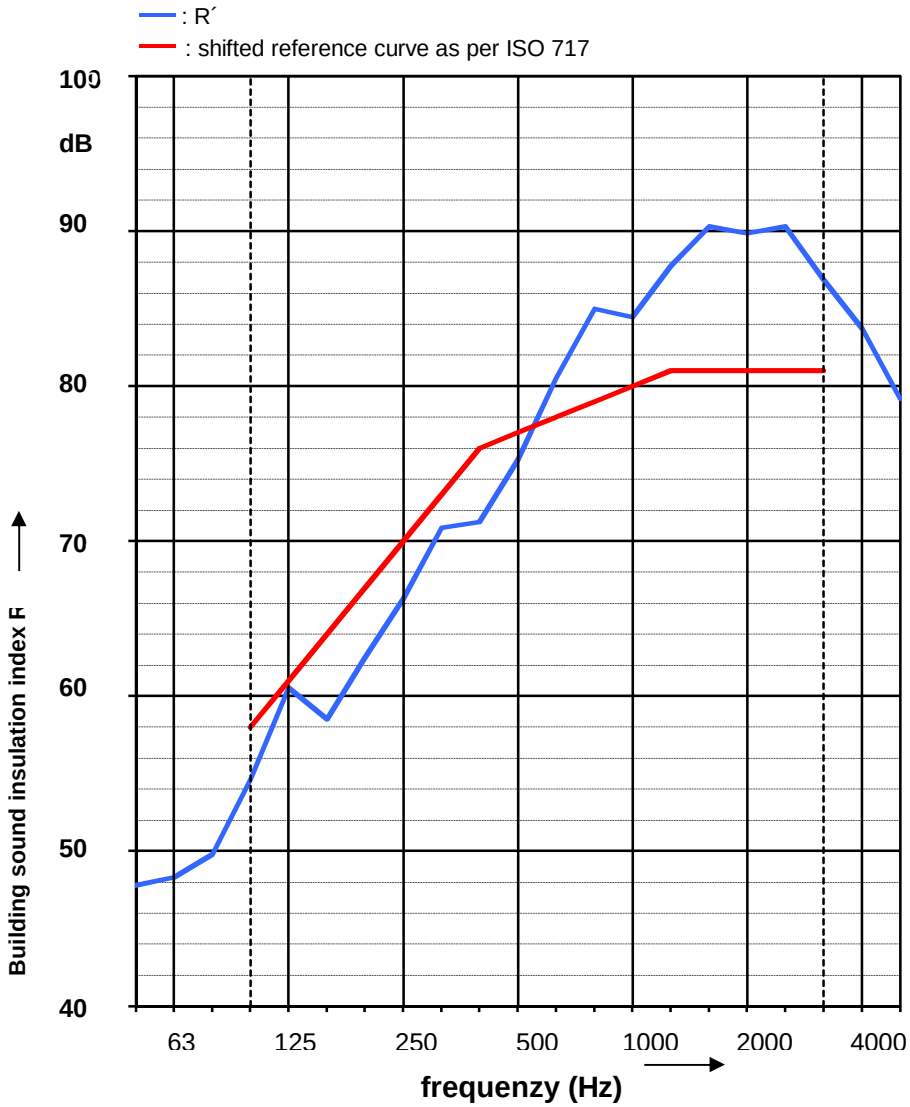
surface area: 11,7 m²

Aufbau des Prüfgegenstandes

Lightweight partition wall, separate framework 2 x CW100
Planking on both sides made of Knauf gypsum boerds
Each structure:
12,5 mm silent board, 12,5 mm diamant, 12,5 mm silent board
ventilation space with mineral fibre insulating material
Knauf TP115 2 x 80 mm, overall structure approx. 485 mm

with 3 x fire protection box HWD90, Typ 9464-01
each member of a pair being directly opposite the other
with device and cabels inserted

Freq.: [Hz]	R´ [dB]	shifted reference curve
50	47,8	
63	48,3	
80	49,8	
100	54,6	58,0
125	60,6	61,0
160	58,5	64,0
200	62,5	67,0
250	66,3	70,0
315	70,9	73,0
400	71,3	76,0
500	75,3	77,0
630	80,6	78,0
800	85,0	79,0
1000	84,5	80,0
1250	87,8	81,0
1600	90,3	81,0
2000	89,9	81,0
2500	90,3	81,0
3150	86,9	81,0
4000	83,7	
5000	79,2	



Evaluation as per ISO 717-1

R'_w (C,C_{tr}) = 77 (-2;-7) dB

$C_{50-3150}$	=	-3	dB	$C_{50-5000}$	=	-2	dB	$C_{100-5000}$	=	-1	dB
$C_{tr50-3150}$	=	-12	dB	$C_{tr50-5000}$	=	-12	dB	$C_{tr100-5000}$	=	-7	dB

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Sound reduction index, as per ISO 140-3: 1995

Appendix:	4
Order no.:	A0388
client: Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	Test date: 24.08.2010

Objekt:

sound insulation and fire protection boxes
Kaiser GmbH
device connection Boxes

Conditions

transmit
volume V = 53,6/61,7 m³

Type: laboratory 1 / laboratory 2
Location: Ground floor

receive
volume V = 61,7/53,6 m³

Type: Laboratory 2 / Laboratory 1
Location: Ground floor

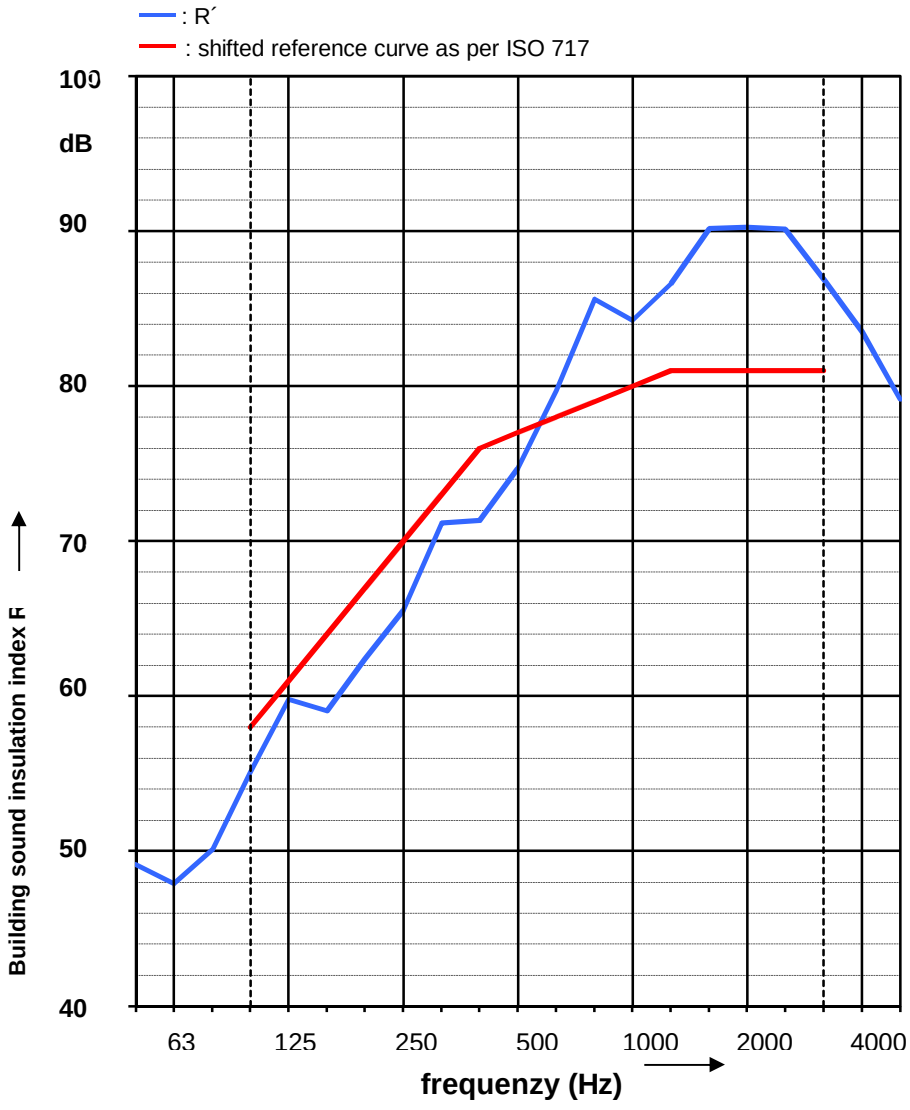
surface area: 11,7 m²

Aufbau des Prüfgegenstandes

Lightweight partition wall, separate framework 2 x CW100
Planking on both sides made of Knauf gypsum boerds
Each structure:
12,5 mm silent board, 12,5 mm diamant, 12,5 mm silent board
ventilation space with mineral fibre insulating material
Knauf TP115 2 x 80 mm, overall structure approx. 485 mm

with 3 x fivefold combination fire protection box HWD90, Typ 946
each member of a pair being directly opposite the other
with device and cabels inserted

Freq.: [Hz]	R´ [dB]	shifted reference curve
50	49,2	
63	47,9	
80	50,1	
100	55,1	58,0
125	59,8	61,0
160	59,1	64,0
200	62,4	67,0
250	65,6	70,0
315	71,2	73,0
400	71,3	76,0
500	74,7	77,0
630	79,7	78,0
800	85,6	79,0
1000	84,3	80,0
1250	86,6	81,0
1600	90,2	81,0
2000	90,3	81,0
2500	90,1	81,0
3150	86,9	81,0
4000	83,5	
5000	79,2	



Evaluation as per ISO 717-1

R'_w (C,C_{tr}) = 77 (-2;-7) dB

$C_{50-3150}$	=	-3	dB	$C_{50-5000}$	=	-2	dB	$C_{100-5000}$	=	-1	dB
$C_{tr50-3150}$	=	-12	dB	$C_{tr50-5000}$	=	-12	dB	$C_{tr100-5000}$	=	-7	dB

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Comparison of sound insulation index

Appendix:	5
Order no.:	A0388
client: Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	Test date: 24.08.2010

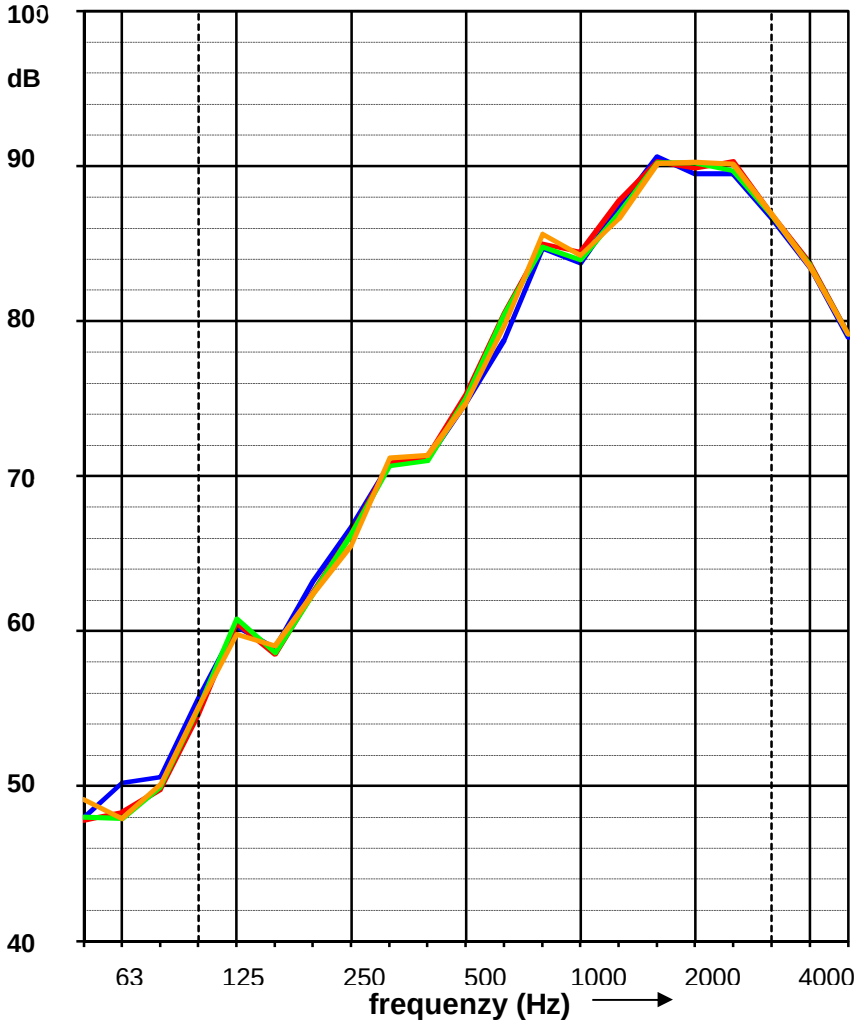
Objekt:

sound insulation and fire protection boxes
Kaiser GmbH
device connection Boxes

Lightweight partition wall, separate framework 2 x CW100
Planking on both sides made of Knauf gypsum boerds
Each structure:
12,5 mm silent board, 12,5 mm diamant, 12,5 mm silent board
ventilation space with mineral fibre insulating material
Knauf TP115 2 x 80 mm, overall structure approx. 485 mm

base wall with different boxes

frequ. [Hz]	range 1	range 2	range 3	range 4
50	48,0	47,8	48,0	49,2
63	50,2	48,3	47,9	47,9
80	50,6	49,8	50,0	50,1
100	55,7	54,6	55,0	55,1
125	60,4	60,6	60,8	59,8
160	58,9	58,5	58,6	59,1
200	63,2	62,5	62,4	62,4
250	66,7	66,3	66,3	65,6
315	70,8	70,9	70,7	71,2
400	71,1	71,3	71,0	71,3
500	74,8	75,3	75,0	74,7
630	78,8	80,6	80,5	79,7
800	84,7	85,0	84,8	85,6
1000	83,8	84,5	84,0	84,3
1250	87,4	87,8	87,0	86,6
1600	90,6	90,3	90,2	90,2
2000	89,5	89,9	90,2	90,3
2500	89,5	90,3	89,7	90,1
3150	86,7	86,9	86,9	86,9
4000	83,5	83,7	83,6	83,5
5000	79,0	79,2	79,2	79,2



range 1: base wall without boxes, 77 dB
range 2: with single fire protection boxes HWD90 with device, 77 dB
range 3: with single fire protection boxes HWD90 with cover plate, 77 dB
range 4: with fivefold fire protection boxes HWD90 with device, 77 dB

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