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 A2283-I
130108 Prüf-I
Gräf (Cert. Eng.), extension: -18

08.Jan.2013

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.:	A2283-I
Drawn up on:	08 January 2013

VMPA SCHALLSCHUTZPRÜFSTELLE NACH DIN 4109

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

AIV

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. 480 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 (4 installation points) as follows:

  - 2 x double device connection box, type 9069-94
  - 2 x double device connection box, type 9069-94
  - 2 x double device connection box, type 9069-74
  - 2 x device connection box, type 9069-01
    2 x device connection box, type 9069-77

    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 = 78 dB
Appendix 2	Sound reduction index with fittings 2 x 2 double-sound protection-electronic-boxes, type 9069-94 1 x 2 double-sound protection-electronic-boxes, type 9069-74 2 x sound protection boxes, type 9069-01 2 x sound protection boxes, type 9069-77 Each member of a pair being directly opposite the other	R_w = 78 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.

VMPA SCHALLSCHUTZPRÜFSTELLE NACH DIN 4109

sound reduction index ISO 140-3:1995	Appendix	1
	order nr.:	A2283
client Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	test date:	14.11.2012

object:

Fa. Kaiser
sound protectionboxes type 9069-01/9069-77
sound protection electronic boxes
type 9069-74/9069-94

Baukonstruktionen:

Senderaum:
volume V = 53,6 m³
condition:
type: laboratory 1
location: ground floor

Empfangsraum:
volume V = 61,7 m³
condition:
type: laboratory 2
location: ground floor

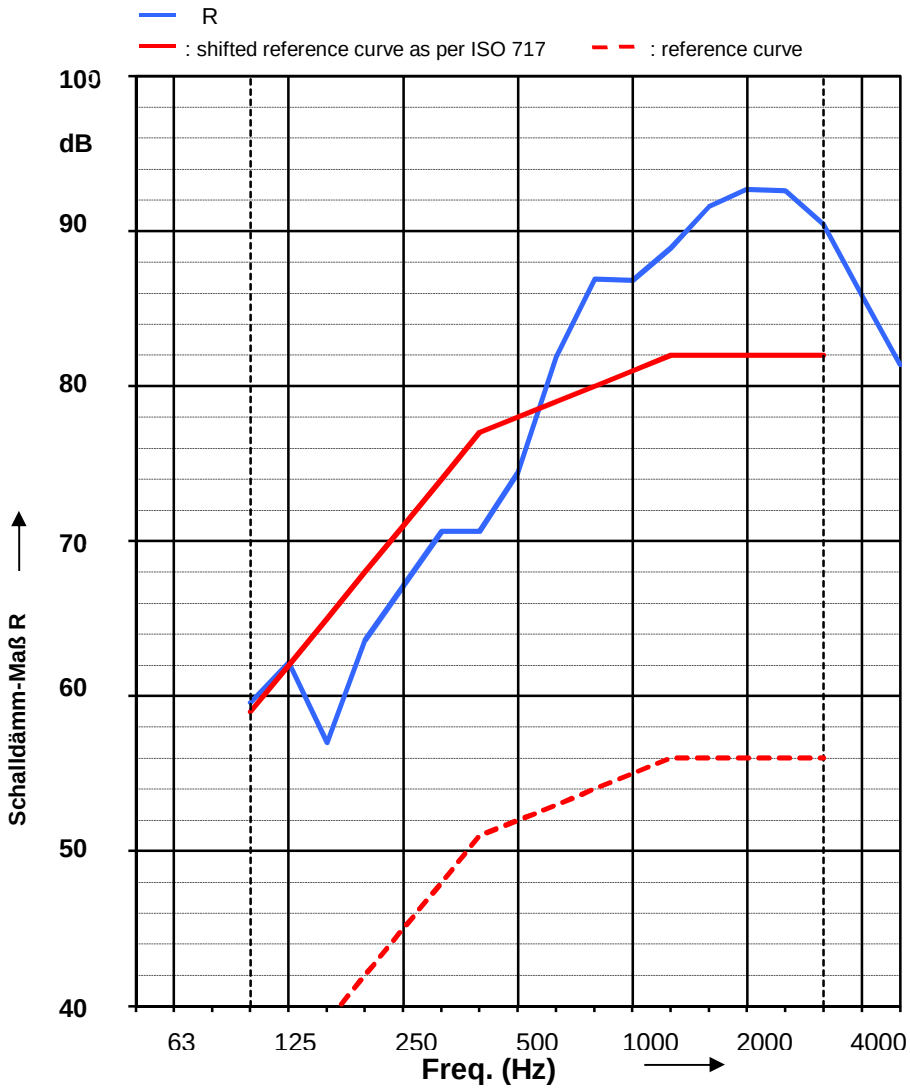
surface area: 11,7 m²

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. 480 mm
Base wall without boxes

Freq.: [Hz]	R [dB]	shifted reference curve
50		
63		
80		
100	59,6	59,0
125	62,2	62,0
160	57,0	65,0
200	63,6	68,0
250	67,1	71,0
315	70,6	74,0
400	70,6	77,0
500	74,4	78,0
630	81,9	79,0
800	86,9	80,0
1000	86,8	81,0
1250	88,9	82,0
1600	91,6	82,0
2000	≥ 92,7	82,0
2500	≥ 92,6	82,0
3150	≥ 90,4	82,0
4000	≥ 85,8	
5000	≥ 81,4	

: noise rate to high



Evaluation as per ISO 717-1

R_w (C,C_{tr}) = 78 (-2;-7) dB

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

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

Date: 20.11.2012 Compiled by: Dipl. Ing. U. Gräf

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sound reduction index ISO 140-3:1995	Appendix	2
	order nr.:	A2283
client Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	test date:	14.11.2012

object:

Fa. Kaiser
sound protectionboxes type 9069-01/9069-77
sound protection electronic boxes
type 9069-74/9069-94

Baukonstruktionen:

Senderaum:
volume V = 53,6 m³
condition:
type: laboratory 1
location: ground floor

Empfangsraum:
volume V = 61,7 m³
condition:
type: laboratory 2
location: ground floor

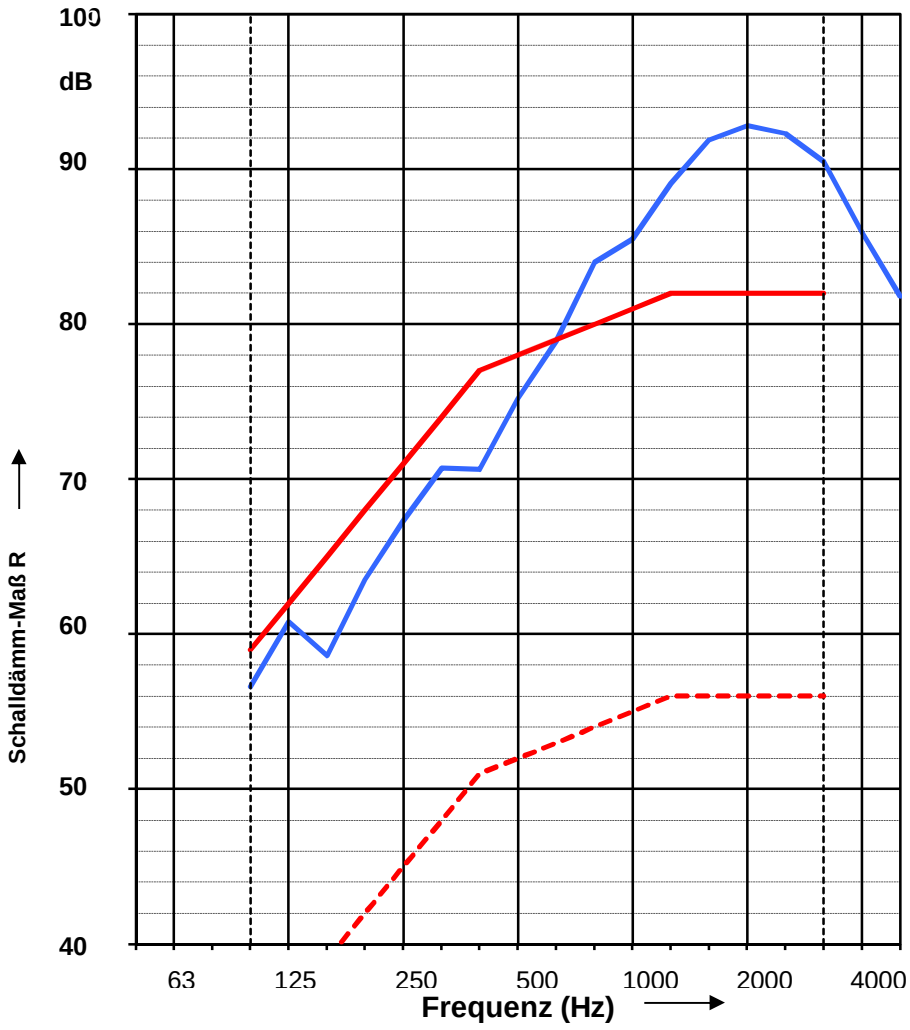
surface area: 11,7 m²

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
base wall with installations as follows
sound protection boxes type 9069-01 / 9069-77 as well as
sound protection ectronic boxes type 9069-74/9069-94
each opposite on both sides, connected up with one another
using empty conduit with cables inserted
insulation material removed in the area of the boxes

Freq.: [Hz]	R [dB]	shifted ference cur Kurve
50		
63		
80		
100	56,6	59,0
125	60,8	62,0
160	58,6	65,0
200	63,5	68,0
250	67,3	71,0
315	70,7	74,0
400	70,6	77,0
500	75,2	78,0
630	78,9	79,0
800	84,0	80,0
1000	85,5	81,0
1250	89,1	82,0
1600	91,9	82,0
2000	≥ 92,8	82,0
2500	≥ 92,3	82,0
3150	≥ 90,5	82,0
4000	≥ 85,9	
5000	≥ 81,8	

:noise rate to high



evaluation as per ISO 717-1

R_w (C,C_{tr}) = 78 (-2;-7) dB

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

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Test centre as per §§ 26, 28 BImSchG
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Date: 20.11.2012 Compiled by: Dipl. Ing. U. Gräf

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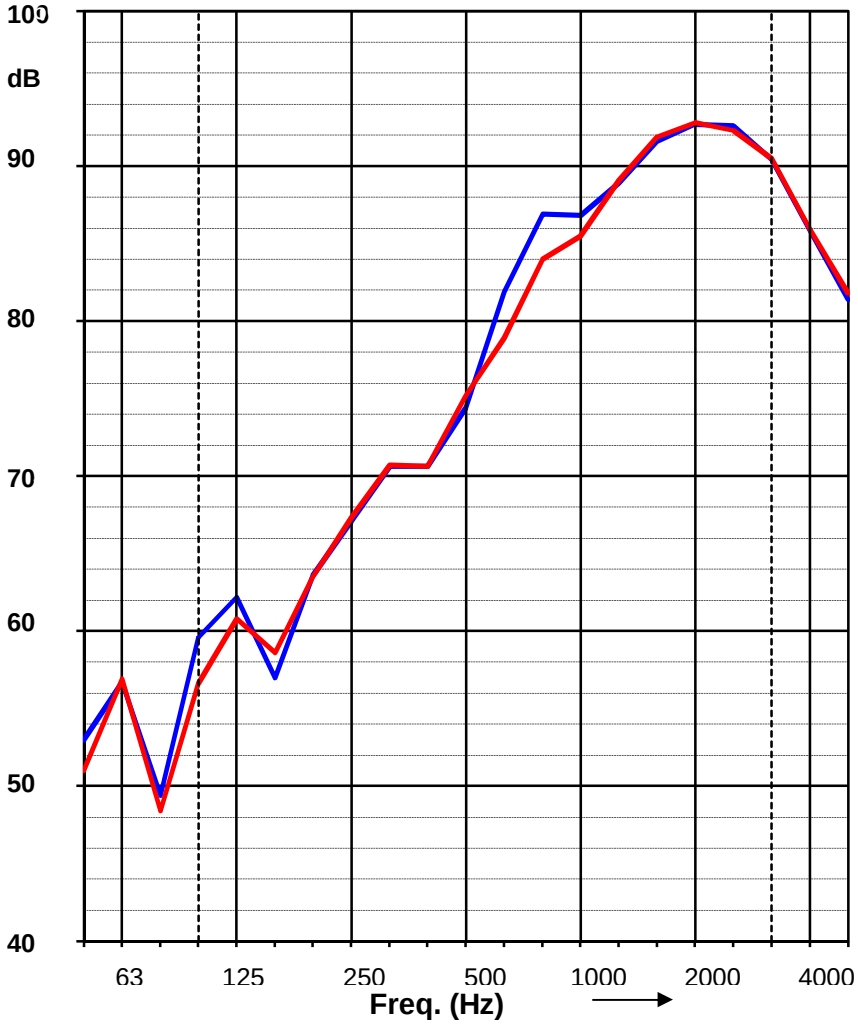
Vergleich der Schalldämm-Maße	Appendix	3
	order nr.:	A2283
client: Kaiser GmbH & Co. KG, Ramsloh 4, 58579 Schalksmühle	test date	14.11.2012

Objekt:

Fa. Kaiser
sound protectionboxes type 9069-01/9069-77
sound protection electronic boxes
type 9069-74/9069-94

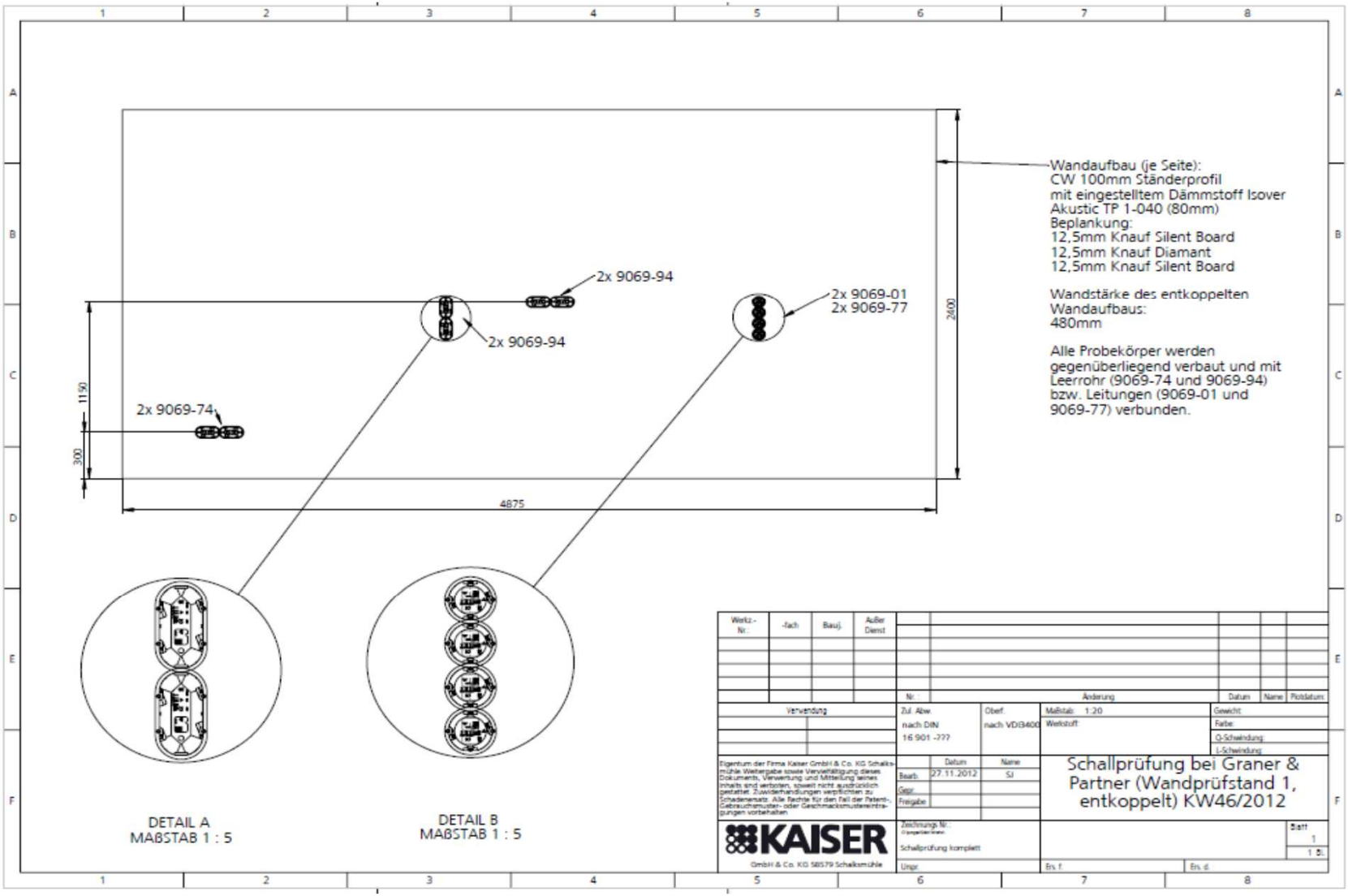
Lightweight partition wall, separate framework 2 x CW100
Planking on both sides made of Knauf gypsum boerds
Each structure:
12,5 mm silent board, 12,5 mm diamant, 12,5 mm silent board
ventilation space with mineral fibre insulating material
Knauf TP115 2 x 80 mm, overall structure approx. 485 mm
base wall with installations as follows
sound protection boxes type 9069-01 / 9069-77 as well as
sound protection ectronic boxes type 9069-74/9069-94
each opposite on both sides, connected up with one another
using empty conduit with cables inserted
insulation material removed in the area of the boxes
comparison of insulation curves with and without installations

Freq.: [Hz]	Range 1	Range 2
50	53,0	51,0
63	56,7	56,9
80	49,4	48,4
100	59,6	56,6
125	62,2	60,8
160	57,0	58,6
200	63,6	63,5
250	67,1	67,3
315	70,6	70,7
400	70,6	70,6
500	74,4	75,2
630	81,9	78,9
800	86,9	84,0
1000	86,8	85,5
1250	88,9	89,1
1600	91,6	91,9
2000	92,7	92,8
2500	92,6	92,3
3150	90,4	90,5
4000	85,8	85,9
5000	81,4	81,8



Range 1: base wall, 78 dB
Range 2: with installations type 9069-01/9069-77/9069-74/9069-94, 78 dB

Kaiser GmbH & Co. KG, 58579 Schalksmühle	Appendix	4
	order nr.	A2283
	test date	14.11.2012



VMPA - recognized sound insulation testing authority as per DIN 4109 Test centre as per §§ 26, 28 BImSchG (German Federal Immission Control)	installation in leightweight wall	GRANER + PARTNER INGENIEURE Raumakustik Tontechnik Bauphysik Schallschutz 51465 Bergisch Gladbach
date: 20.11.2012 **compiled by Dipl. Ing. U. Gräf**		

Kaiser GmbH & Co. KG	appendix	5
	order nr.:	A2283
	test date	14.11.2012

picture nr. 1	wall with device connection boxes

picture nr. 2	wall with device connection boxes, with devices

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Test centre as per §§ 26, 28 BImSchG
(German Federal Immission Control)

date: 20.11.2012 compiled by Dipl. Ing. U. Gräf

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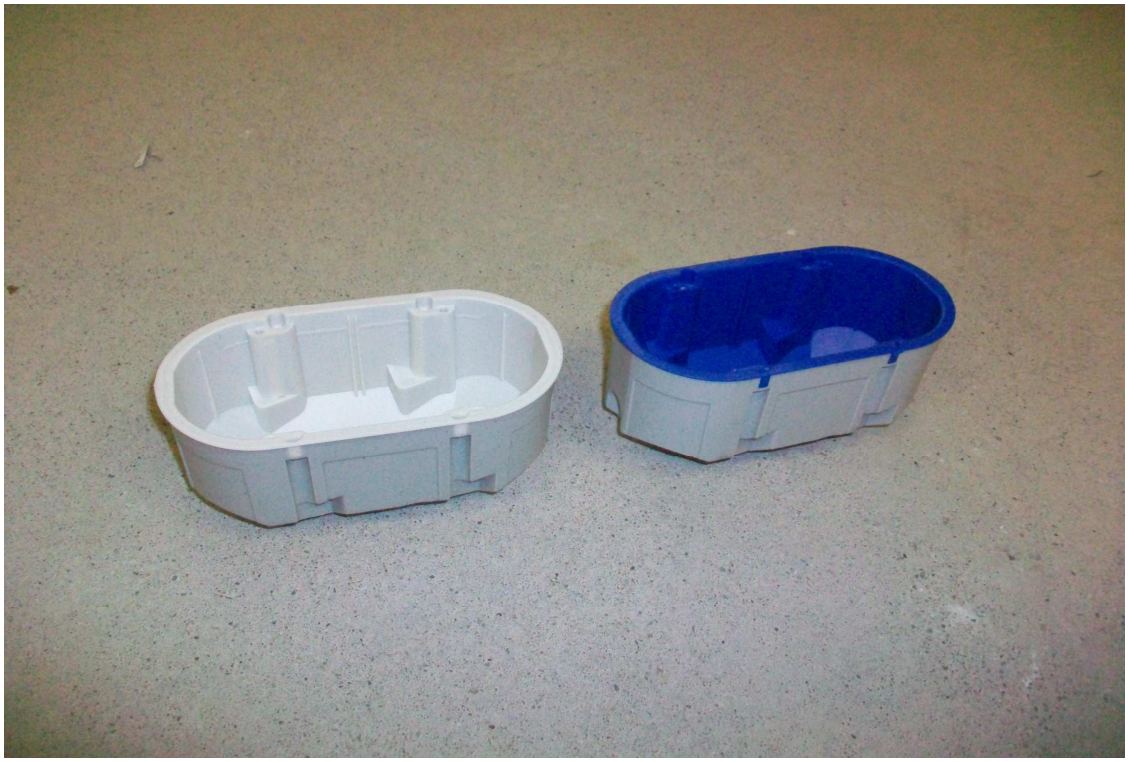
Kaiser GmbH & Co. KG	appendix	6
	order nr.:	A2283
	test date	14.11.2012



picture nr. 3	device connetion boxes

picture nr. 4	device connetion boxes

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Test centre as per §§ 26, 28 BImSchG
(German Federal Immission Control)

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Kaiser GmbH & Co. KG	appendix	7
	order nr.:	A2283
	test date	14.11.2012

picture nr. 5	wall with installation points

picture nr. 6	installation point

Kaiser GmbH & Co. KG	appendix	8
	order nr.:	A2283
	test date	14.11.2012

picture nr. 7	installation point

picture nr. 8	installation point