ITA INGENIEURGESELLSCHAFT
FÜR TECHNISCHE AKUSTIK MBH
BERATENDE INGENIEURE VBI

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Testing body recognized by the DIBT for the issue of general building authority test certificates
VMPA-recognized sound insulation testing body in accordance with DIN 4109
Test point in accordance with Section 29b BImSchG [German Federal Immission Control Act] for noises and vibrations

TEST REPORT

F-TRONIC POWER SOCKETS
TYPE FIRE PROTECTION BS2000
INSTALLED IN A LIGHTWEIGHT WALL CW 50/100, D = 100 mm

MEASURING OF THE SOUND INSULATION
IN ACCORDANCE WITH EN ISO 10 140-2

0015.18 – P 24/18

CONTRACTOR:

F-TRONIC GMBH
ZUM GERLEN 21-25
66131 SAARBRÜCKEN

2018-03-15
Editor: Michael Sommer

f-tronic power sockets - type fire prevention BS2000
Installed in lightweight wall CW 50/100, d = 100 mm
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1. PURPOSE OF THE MEASUREMENTS

Testing had to be carried out whether the airborne sound insulation is impaired when opposing f-tronic power sockets (cavity wall sockets), type fire protection BS2000, are installed in a lightweight wall CW 50/100, d = 100 m. 5 sound insulation sockets with switches/sockets and blind frames each were installed. Measurements of the airborne sound insulation of the lightweight wall with and without power sockets were carried out to determine the values.

2. DATE OF MEASUREMENT

The measurements took place on 2018-02-07 in our wall test bench P-W1.

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3. TEST ARRANGEMENT

3.1 Test set-up

Lightweight wall CW 50/100, d = 100 m:

2 x 12.5 mm	gypsum plasterboard "Knauf Diamant", surface-related mass approx. 13 kg/m²
50 mm	UW/CW profile, into which the following are inserted: 40 mm mineral wool, Knauf insulation, partition plate TP 115, length-related flow resistance ≥ 5 kPa x s/m²
2 x 12.5 mm	gypsum plasterboard "Knauf Diamant", surface-related mass approx. 13 kg/m²

Arrangement of the power sockets, type fire protection BS2000, in the lightweight wall:

Quantity:	5 power sockets, equipped with empty conduits and cables, arranged under each other, 3 x switches and 2 x sockets on both sides,
Arrangement:	located opposite each other, (see Appendix 2)

The technical data sheet of the sound insulation socket is displayed in Appendix 3.

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3.2 Installation situation in test bench

The lightweight wall was installed by a drywall construction company commissioned by the contractor in our test bench P-W1 with suppressed flanking sound transmission. The test bench joint was located in front of the test arrangement on the source room side. The sound insulation sockets were installed in the lightweight wall by the contractor. The installation situation in the test bench is shown in Appendix 1.

3.3 Maximum sound reduction index of the test arrangement

The maximum sound reduction index depends on the type of the tested component and the installation conditions in addition to the state of the test bench.

EN ISO 10 140-5 Appendix A regulates that the $R'_{w,max}$ values have to be specified for a representative partition wall construction in the test report, namely for that representative construction "which is most similar to the component usually tested in the test bench".

In the present case the lightweight wall type A in accordance with EN ISO 10 140 is considered as the most similar representative construction.

The $R'_{w,max}$ values are entered in the appendix sheet. This results in a maximum sound reduction index of $R'_{w,max}$ = 69 dB, referenced to the test area of 13.41 m^2.

4. MEASURING METHOD

4.1.1 Applied standards

[1] EN ISO 10 140:2010-05 "Measurement of sound insulation in buildings and of building elements in the test bench",
Part 1:2014-09 "Application rules for specific products"
Part 2:2010-12 "Measurement of the airborne sound insulation"
Part 4:2010-12 "Measuring methods and requirements"
Part 5:2014-09 "Requirements at test benches and test devices"

[2] EN ISO 3382:2008-09 "Acoustics - Measurement of room acoustics parameters"

[3] EN ISO 717:2013-06 "Rating of sound insulation in buildings and of building elements"
Part 1 "Airborne sound insulation"

[4] EN ISO 12 999-1:2014-09 "Acoustics – Determination and application of measurement uncertainties in building acoustics – Part 1: Sound insulation".

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4.2 Determination of the sound insulation

The tests were performed in accordance with EN ISO 10 140 "Measurement of the sound insulation of building parts in the test bench", Part 2 "Measurement of the airborne sound insulation".

The sound insulation index R' was determined in accordance with the following equations:

$$R'_i = D_i + 10 \log \frac{S}{A} \text{ in dB} \qquad [1]$$

$$R' = -10 \log \frac{1}{m} \sum_{j=1}^{m} 10^{-R'j/10} \text{ in dB} \qquad [2]$$

This means:

R'_i = Sound reduction index for speaker position j

D_i = Level difference of the energetically determined sound pressure levels between source and receiving room in dB for speaker position j

S = Area of the joint partition component in m^2

A = Equivalent absorption area of the receiving room in m^2

m = Number of speaker positions.

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The sound pressure level was determined at ten microphone positions for two loudspeaker positions. The energetically taken mean of the sound pressure level was determined from the results. The integration time per measuring position amounted to 20 s respectively.

The basic noise level was not sufficiently low in some cases, so that a corresponding correction in accordance with EN ISO 10 140-4 was required.

The equivalent absorption area was determined from a reverberation measurement in accordance with the relationship

$$A = 0.16 \frac{V}{T} \text{ in } m^2.$$

.

This means:

V = Volume of the receiving room in m^3

T = Reverberation time in s.

The reverberation time was determined in accordance with the specifications of EN ISO 10 140-4, Section 4.6.2 "Measurement of the reverberation time". This references ISO 3382-2 "Reverberation time in ordinary rooms".

The procedure with switched off noise was used. Two reverberation times each were recorded at the microphone individual positions. The arithmetic mean was formed from the individual measured values.

The weighted sound insulation index R_w as well as the spectrum adjustment values C and C_{tr} were determined in accordance with ISO 717-1, German version DIN EN ISO 717-1 "Evaluation of the sound insulation in buildings and parts", Part 1 "Airborne sound insulation".

The sound insulation index R'_M was corrected in accordance with EN ISO 10 140-2, Appendix A, Section 3 "Evaluation", with the values of the flanking sound transmission R'_F. This results in the corrected sound insulation index R of the test component dB.

With regard to the repeatability standard deviation σ_r and the reproducibility standard deviation σ_R, reference is made to Tables 2 and 3 of EN ISO 12 999-1 "Measuring the sound insulation index in buildings and building elements".

The results in the frequency range of 50 Hz to 80 Hz are influenced by the geometrical circumstances of the test bench. The display of these measured values is for information purposes only.

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5. MEASURING DEVICES

Designation	Type	Serial Number
Real-time analyzer channel A (calibrated up to and including 2019)	Norsonic 140	1406838/17
in combination with:		
Condenser microphone (channel A)	Norsonic 1225	285515
Microphone preamplifier (channel A)	Norsonic 1209	20605
Real-time analyzer channel B (calibrated up to and including 2019)	Norsonic 140	1406839/17
in combination with:		
Condenser microphone (channel B)	Norsonic 1225	264828
Microphone preamplifier (channel B)	Norsonic 1209	21098
Calibrator	Norsonic 1251	34972
Speaker combination (dodecahedron)	Norsonic 276	2766009
Power amplifier	Norsonic 280	2804415
Thermal hygrometer	Lambrecht 202	
Barometer	B+K ZU 0003	

The measuring devices were calibrated before and after the measurements. There were no deviations.

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6. MEASURING RESULTS

The measuring results are documented numerically and graphically in Appendixes 4 and 5 and summarized in the following table. A comparison of the results with and without power sockets is displayed in Appendix 6.

Table: Weighted sound reduction index $R_{w,P}$ (test bench value)

App. No.	Test set-up	Weighted sound reduction index $R_{w,P}$ in dB
4	Lightweight wall CW 50/100, d = 100 m Without power sockets	55 (55.0)
5	Lightweight wall CW 50/100, d = 100 m with 5 power sockets each, Type fire protection BS2000, arranged on both sides opposite each other	55 (55.3)

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7. GENERAL REMARKS

The results reference solely the tested objects.

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THIS REPORT INCLUDES 10 PAGES AND 6 APPENDIXES.

WIESBADEN, ON 2018-03-15

ITA INGENIEURGESELLSCHAFT
FÜR TECHNISCHE AKUSTIK MBH

Dr. Maack	Sommer
Deputy test center manager	Processing employee Head of the measurement technology

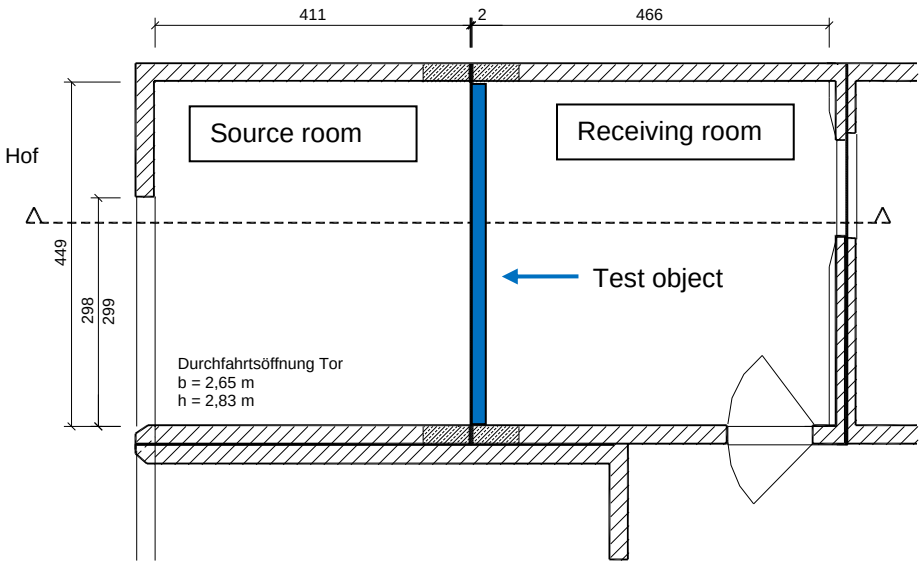
Installation of the test object

f-tronic power sockets - type fire prevention BS2000

Contractor: f-tronic GmbH
Zum Gerlen 21-25, 66131 Saarbrücken

Wall test stand P-W1 with suppressed flanking transmission in accordance with EN ISO 10140

GRUNDRISS



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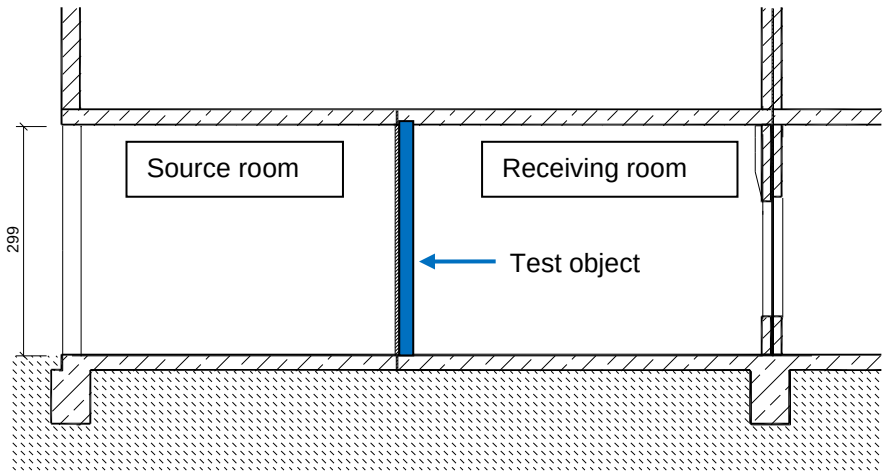
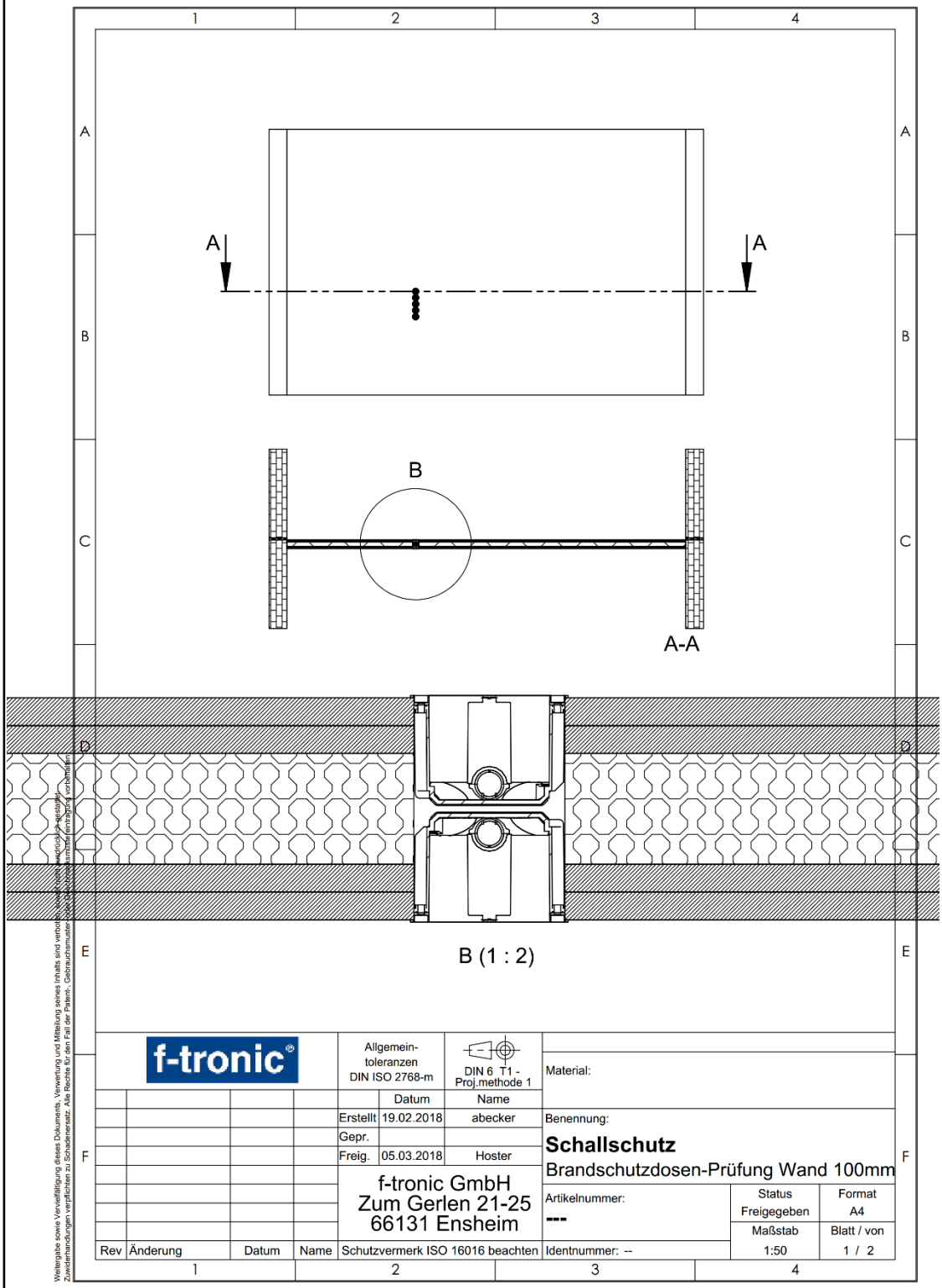


Installation of the test object

f-tronic power sockets - type fire prevention BS2000

Contractor: f-tronic GmbH
Zum Gerlen 21-25, 66131 Saarbrücken

Drawing of the contractor (not to scale)

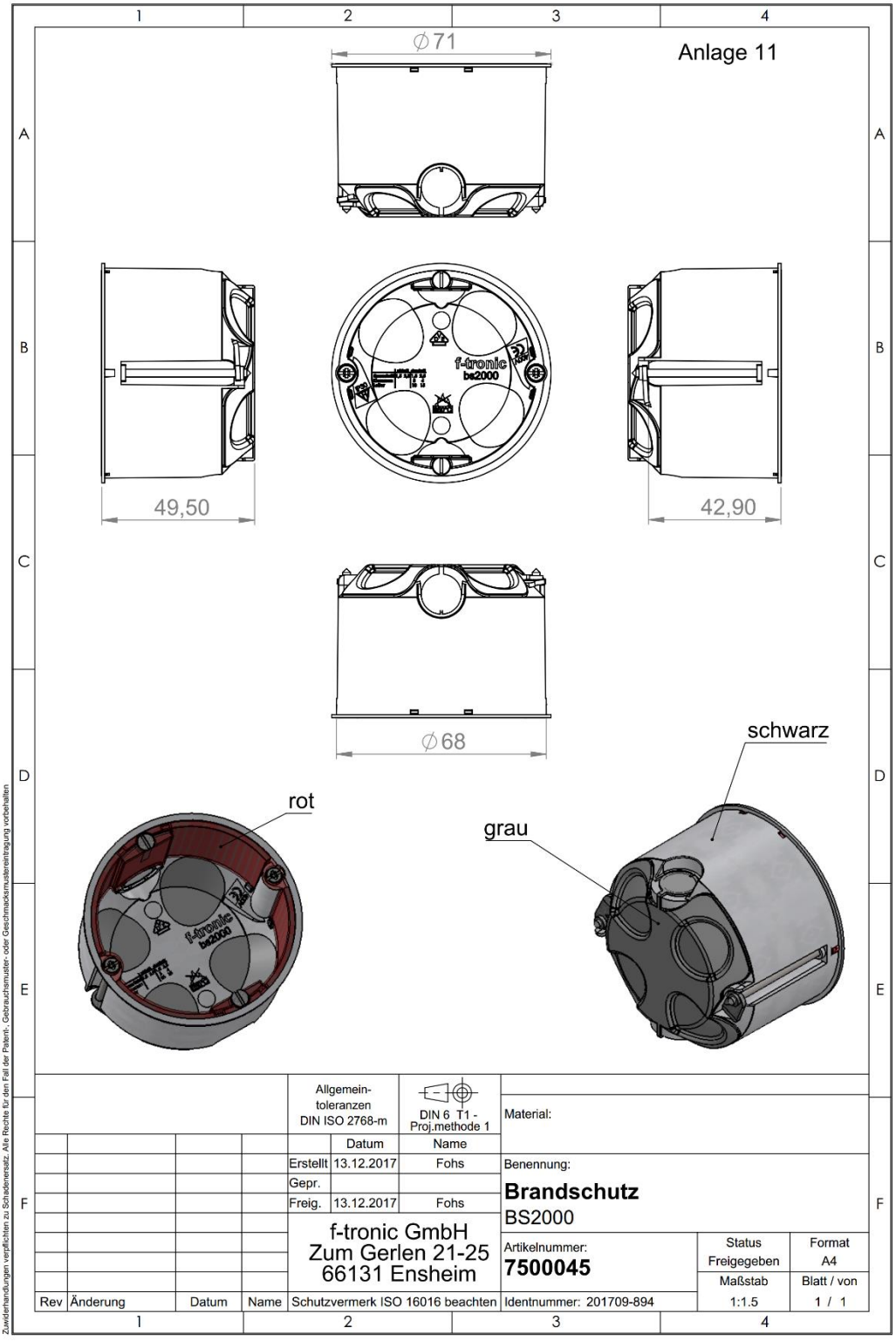


Structure of the test object

f-tronic power sockets - type fire prevention BS2000

Contractor: f-tronic GmbH
Zum Gerlen 21-25, 66131 Saarbrücken

Drawing of the contractor (not to scale)



Measurement of the airborne sound reduction in accordance with ISO 10140-2

Measurement of the airborne sound insulation of building elements in the test bench

f-tronic power sockets - type fire prevention BS2000

Contractor: f-tronic GmbH
Zum Gerlen 21-25, 66131 Saarbrücken

Manufacturer: f-tronic GmbH Product designation: Test wall

Test object installed: Fitters of the contractor

Description of the test bench, the test object and the test arrangement:

Identification of the test rooms: Window test bench P-W1 in accordance with EN ISO 10140; maximum sound reduction index: R'max,w = 6

Test arrangement without power sockets

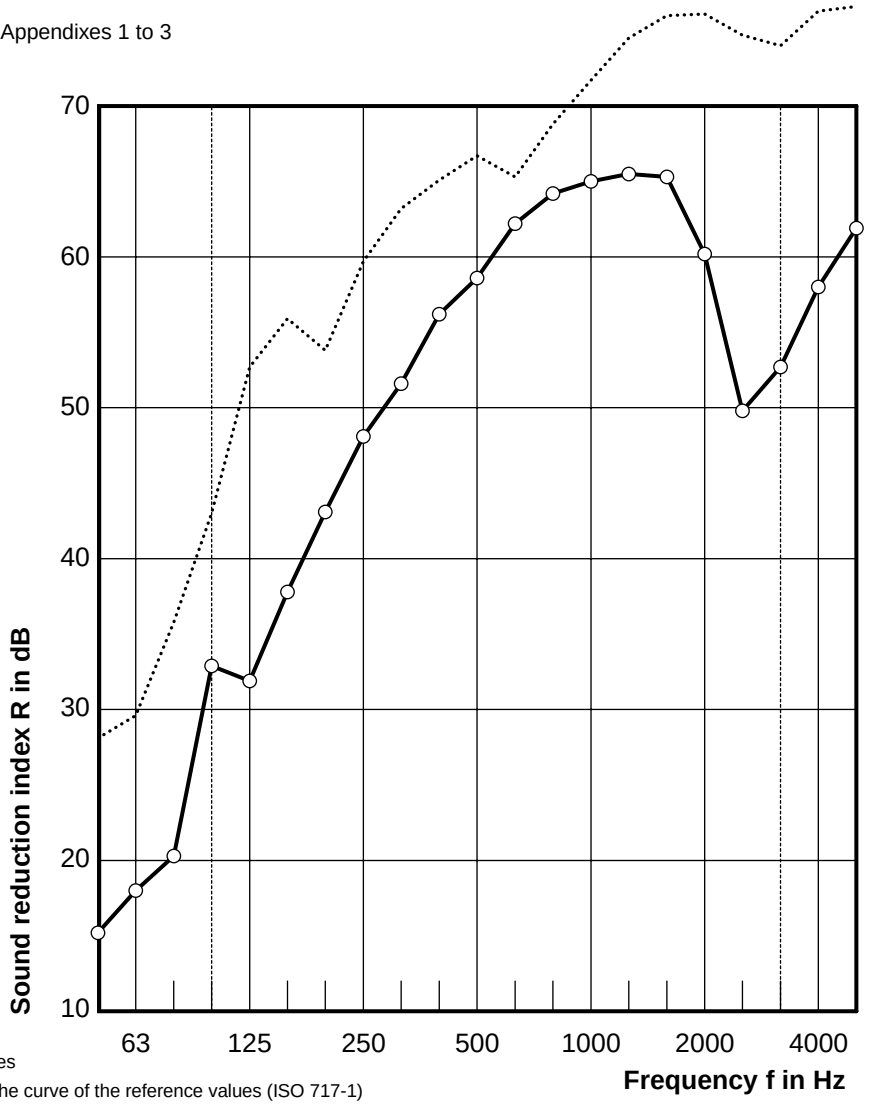
Metal stud partition CW 50/100, with single metal stud frame, two-layer cladding, total thickness 100 mm:

2 x12.5 mm	Gypsum plasterboard "Knauf Diamant", surface related mass: approx. 13 kg/m²
50 mm	UW/CW profile, into which the following are inserted: 40 mm mineral wool, Knauf insulation partition plate TP 115
2 x12.5 mm	Gypsum plasterboard "Knauf Diamant", surface related mass: approx. 13 kg/m²

Installation and set-up of the test object, see Appendixes 1 to 3

Setting time:	--	hPa
Surface-related mass:	--	kg/m²
Air temperature in the test be	17	°C
Relative humidity:	54	%
Static pressure:	998	hPa
Volume source room:	56	m³
Volume receiving room:	63	m³
Test date:	07.02.2018	

Frequency f Hz	R Third dB	R'_{max} Third dB
50	15,2	28,1
63	18,0	29,6
80	20,3	35,8
100	32,9	43,0
125	31,9	52,7
160	37,8	55,9
200	43,1	53,8
250	48,1	59,7
315	51,6	63,2
400	56,2	65,1
500	58,6	66,7
630	62,2	65,3
800	64,2	68,8
1000	65,0	71,7
1250	65,5	74,5
1600	65,3	76,0
2000	60,2	76,1
2500	49,8	74,7
3150	52,7	74,0
4000	58,0	76,3
5000	61,9	76,6



Mindestwerte
——— Displaced curve of the reference values
---------- Frequency range in accordance with the curve of the reference values (ISO 717-1)
..... Maximum noise insulation of the test bench with regard to the test area

Evaluation in accordance with ISO 717-1: The determination is based on test bench measurement results which were obtained in accordance with a s

$R_{w,P}$ (C; C_{tr}) = 55 (-3 ; -7) dB **$C_{50-5000}$ = -7 dB** **$C_{tr,50-5000}$ = -19 dB**

Measurement of the airborne sound reduction in accordance with ISO 10140-2

Measurement of the airborne sound insulation of building elements in the test bench

f-tronic power sockets - type fire prevention BS2000

Contractor: f-tronic GmbH
Zum Gerlen 21-25, 66131 Saarbrücken

Manufacturer: f-tronic GmbH

Product designation: Test wall with power sockets "Fire protection BS2700"

Test object installed: Fitters of the contractor

Description of the test bench, the test object and the test arrangement:

Identification of the test rooms: Window test bench P-W1 in accordance with EN ISO 10140; maximum sound reduction index: R'max,w = 69

Test arrangement with 5 power sockets each

Metal stud partition CW 50/100, with single metal stud frame, two-layer cladding, total thickness 100 mm:

2 x12.5 mm	Gypsum plasterboard "Knauf Diamant", surface related mass: approx. 13 kg/m²
50 mm	UW/CW profile, into which the following are inserted: 40 mm mineral wool, Knauf insulation partition plate TP 115
2 x12.5 mm	Gypsum plasterboard "Knauf Diamant", surface related mass: approx. 13 kg/m²

Arrangement of the power sockets:
- on both sides with 3 switches and 2 sockets each
- Opposing installation on both sides in the transmission and receiving room

Installation and set-up of the test object, see Appendixes 1 to 3

Setting time:	--	hPa
Surface-related mass:	--	kg/m²
Air temperature in the test be	17	°C
Relative humidity:	54	%
Static pressure:	998	hPa
Volume source room:	56	m³
Volume receiving room:	63	m³
Test date:	07.02.2018	

Frequency f Hz	R Third dB	R'_{max} Third dB
50	15,4	28,1
63	18,4	29,6
80	19,1	35,8
100	33,3	43,0
125	31,6	52,7
160	39,4	55,9
200	43,5	53,8
250	48,0	59,7
315	51,7	63,2
400	56,4	65,1
500	58,1	66,7
630	61,2	65,3
800	62,4	68,8
1000	64,2	71,7
1250	65,2	74,5
1600	65,1	76,0
2000	59,9	76,1
2500	49,7	74,7
3150	52,9	74,0
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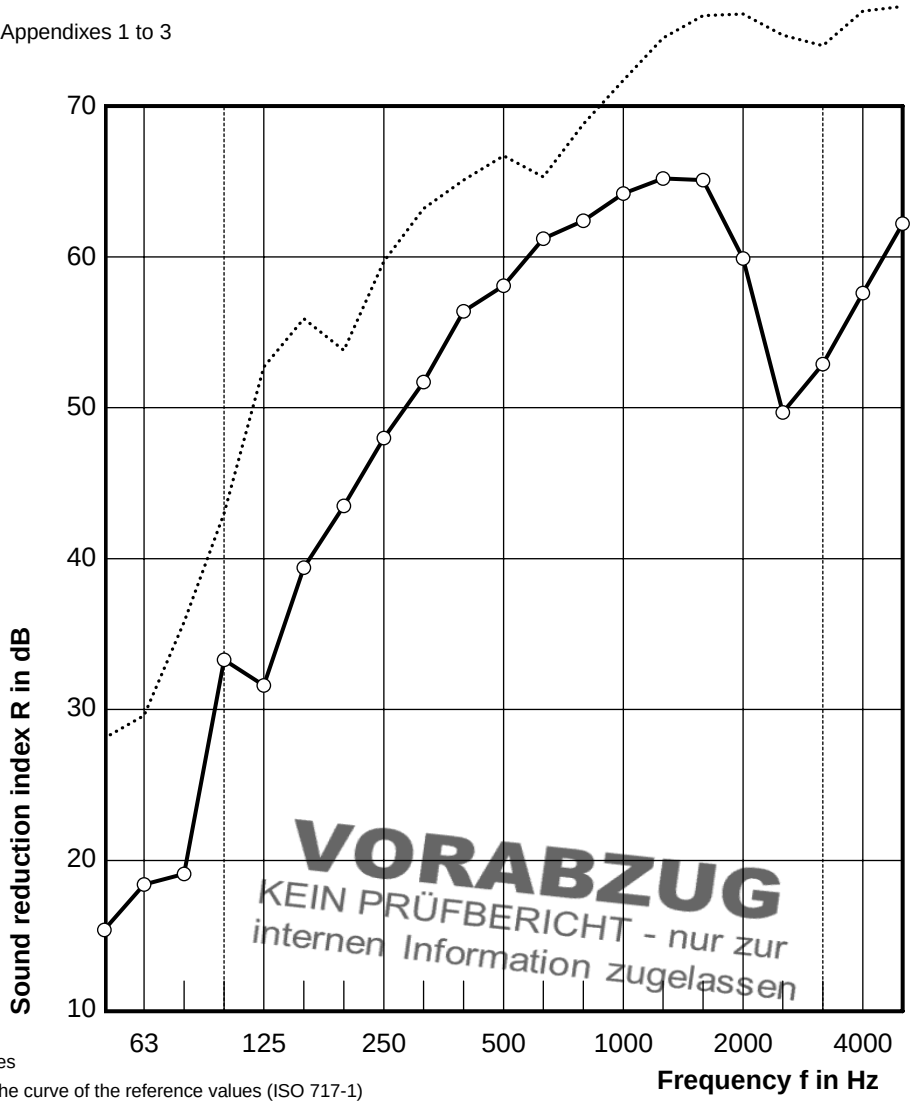


Mindestwerte
——— Displaced curve of the reference values
---------- Frequency range in accordance with the curve of the reference values (ISO 717-1)
..... Maximum noise insulation of the test bench with regard to the test area

Evaluation in accordance with ISO 717-1: The determination is based on test bench measurement results which were obtained in accordance with a standard procedure

$R_{w,P}$ (C; C_{tr}) = 55 (-3 ; -7) dB **$C_{50-5000}$ = -7 dB** **$C_{tr,50-5000}$ = -19 dB**

Measurement of the airborne sound reduction in accordance with ISO 10140-2

Measurement of the airborne sound insulation of building elements in the test bench

f-tronic power sockets - type fire prevention BS2000

Contractor: f-tronic GmbH
Zum Gerlen 21-25, 66131 Saarbrücken

Manufacturer: f-tronic GmbH Product designation:Test wall with power sockets "Fire protection BS2700"

Test object installed: Fitters of the contractor

Description of the test bench, the test object and the test arrangement:

Identification of the test rooms: Window test bench P-W1 in accordance with EN ISO 10140; maximum sound reduction index: R'max,w = 69 dB

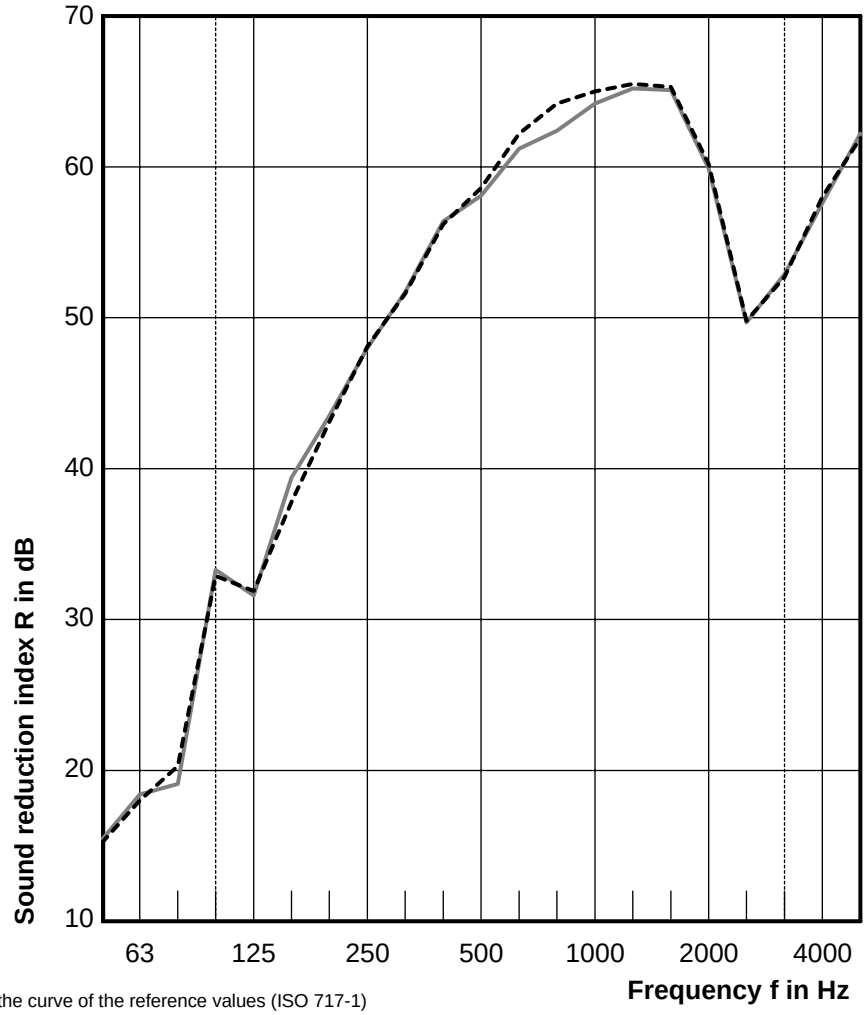
Comparative representation of the results with and without power sockets

- - - - - - Lightweight wall CW 50/100 without power sockets
Weighted sound reduction index $R_{w,P}$ = 55 dB (see Appendix 4)

——— Lightweight wall CW 50/100 with power socket, type fire protection BS2000, both sides, arranged opposite each other
Weighted sound reduction index $R_{w,P}$ = 55 dB (see Appendix 5)

Installation and set-up of the test object, see Appendixes 1 to 3

Setting time:	--	hPa
Surface-related mass:	--	kg/m²
Air temperature in the test be	17	°C
Relative humidity:	54	%
Static pressure:	998	hPa
Volume source room:	56	m³
Volume receiving room:	63	m³
Test date:	07.02.2018	



---------- Frequency range in accordance with the curve of the reference values (ISO 717-1)