Evidence of Performance
Joint sound reduction of filling material

Test Report
no. 20-003721-PR01
(PB 02-K05-04-en-01)

Client	**Selena Labs Sp.zo.o** ul. Pieszycka 1 58-200 Dzierzoniow Poland
Product	1-K polyurethane foam
Designation	B1 Gun PU Foam
Density	20,8 g/l for 10 mm width of joint, 20,8 g/l for 20 mm width of joint
Special features	-/-

Weighted joint sound reduction index $R_{S,w}$
Spectrum adaptation terms C and C_{tr}

width of joint 10 mm

$$[R_{S,w}\ (C;\ C_{tr}) \geq 63\ (-2;\ -6)\ \text{dB}]$$

width of joint 20 mm

$$[R_{S,w}\ (C;\ C_{tr}) \geq 62\ (-1;\ -5)\ \text{dB}]$$

ift Rosenheim
25.09.2020

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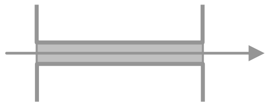
Operating Testing Officer
Building Acoustics

Basis

EN ISO 10140-1: 2016
EN ISO 10140-2 : 2010
EN ISO 717-1 : 2013

Representation



Instructions for use

This procedure is suitable for the comparison of construction products designed for sealing (e.g. gaskets/seals, fillers for joints). The results can be used to evaluate the sound power ratio τ_e according to EN ISO 12354-3 Annex B.
Using the calculated sound reduction of the joint for the calculation of the overall sound reduction is not a substitute for the sound reduction verification of the overall construction.

Validity

The data and results given relate solely to the tested and described specimen.

Testing the sound insulation does not allow any statement to be made on any further characteristics of the construction submitted regarding performance and quality.

Notes on publication

The **ift** Guidance Sheet "Conditions and Guidance for the Use of **ift** Test Documents" applies.

The cover sheet can be used as an abstract.

Contents

The test report contains a total of 10 pages:

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1 Object

1.1 Description of test specimen

Product	1-K polyurethane foam
Date of manufacturing of test specimen	18th September 2020
Product designation	B1 Gun PU Foam
Article No.	80000013
Material	Polyurethane
Dimension	
Length of joint l	1,200 mm
Depth of joint d	100 mm
Width of joint w	10 mm and 20 mm
Joint cover	Without cover
Curing time	6 days
Density	20,8 g/l for 10 mm width of joint, 20,8 g/l for 20 mm width of joint

The description is based on inspection of the test specimen at the **ift** Laboratory for Building Acoustics. Item designations / numbers as well as material specifications were provided by the client. Additional data provided by the manufacturer are marked with *.

1.2 Mounting to test rig

The sound reduction index R_s of the joint was measured in a mobile joint measuring apparatus as per EN ISO 10140-1:2016, Annex J, (see Figs. 1 and 2). This mobile measuring apparatus consists of a high-performance sound insulating element made of metal profiles and Bondal sheet with slide-in cassettes. The profiles of the slide-in cassettes are filled with sand. Using these cassettes, a great variety of joints with varying joint widths w can be created (Fig. 1).

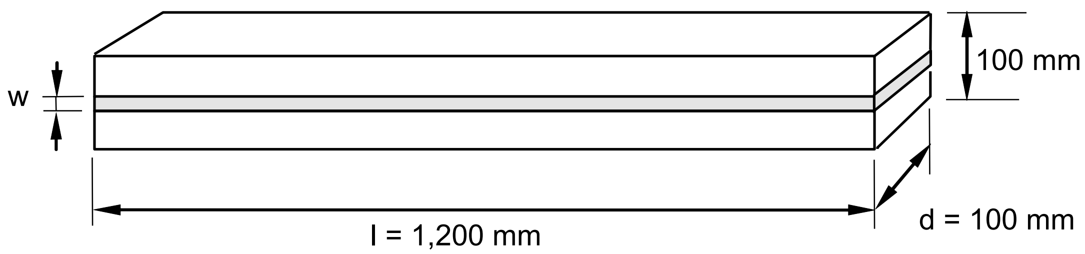


fig 1 Slide-in cassettes

These slide-in cassettes were filled 6 days before the test by employees of the **ift** with the filling material acc. to the guideline of the manufacturer. After curing the filling material was cut off and the cassettes were mounted to the high-performance sound insulating frame (Fig. 2). The frame was then mounted to the test opening in the separating wall of the window test rig as per EN ISO 10 140-5. The test opening connecting joints were filled with foamed material and sealed on both sides with plastic sealant.

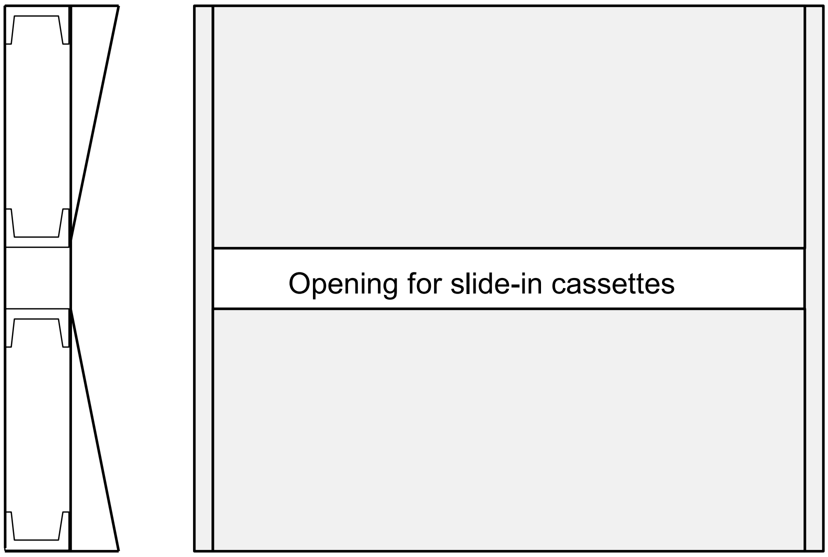


fig 2 Set-up of joint testing apparatus (high performance sound insulating element)

fig 3 Photo of the mounted element, taken by ift Laboratory for Building Acoustics

2 Procedure

2.1 Sampling

Sampling	The samples were selected by the client. The slide-in cassettes were filled by employees of the **ift** with the filler to be tested according the instruction of the manufacturer.
Quantity	1
Manufacturer	Selena Labs Sp.zo.o
Manufacturing plant	no information
Date of manufacture / Date of sampling	18th August 2020
Responsible person in charge	no information
Delivery at **ift**	17th September 2020 by delivery service.
ift registration number	51635/02

2.2 Process

Basis

EN ISO 10140-1:2016	Acoustics; Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products (ISO 10140-1: 2016); German version EN ISO 10140-1:2016
EN ISO 10140-2:2010	Acoustics; Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140-2:2010)
EN ISO 717-1: 2013	Acoustics; Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation

Corresponds to the national German standard/s:

DIN EN ISO 10140-1:2016-12, DIN EN ISO 10140-2:2010-12 and DIN EN ISO 717-1 : 2013-06

Boundary conditions	As specified by the standard.
Deviation	There are no deviations from the test method/s and/or test conditions.
Test noise	Pink noise
Measuring filter	One-third-octave band filter
Measurement limits	
Low frequencies	The test rooms full fill the recommended size for testing in the frequency range from 50 Hz to 80 Hz as per EN ISO 10140-4:2010 Annex A (informative). A moving loudspeaker was used.
Background noise level	The background noise level in the receiving room was determined during measurement and the receiving room level

	L_2 corrected by calculation as per EN ISO 10140-4: 2010 Clause 4.3.
Maximum insulation	The maximum insulation of the test rig is partly within the range of the test results. Therefore the tested values are minimum values. A correction by calculation was performed for maximum sound insulation.
Measurement of reverberation time	Arithmetical mean: two measurements each of 2 loudspeaker and 3 microphone positions (a total of 12 independent measurements).
Measurement equation A	$A = 0{,}16 \cdot \frac{V}{T}$ m²
Measurement of sound level difference	Minimum of 2 loudspeaker positions and rotating microphones.
Measurement equation	$R_S = L_1 - L_2 + 10 \log \frac{S_N \cdot l}{A \cdot l_N}$ dB

KEY

R_S	Joint sound reduction index in dB
L_1	Sound pressure level source room in dB
L_2	Sound pressure level receiving room in dB
l	Length of joint in m
S_N	Reference area (1 m²)
l_N	Reference length (1 m)
A	Equivalent absorption area in m²
V	Volume of receiving room in m³
T	Reverberation time in s

2.3 Test apparatus

Device	Type	Manufacturer
Integrating sound meter	Type Nortronic 830	Norsonic-Tippkemper
Microphone preamplifiers	Type 1201	Norsonic-Tippkemper
Microphone unit	Type 1220	Norsonic-Tippkemper
Calibrator	Type 1251	Norsonic-Tippkemper
Dodecahedron loudspeakers	Type 229	Norsonic-Tippkemper
Amplifier	Type 235	Norsonic-Tippkemper
Rotating microphone boom	Type 265	Norsonic-Tippkemper

The ift Laboratory for Building Acoustics participates in comparative measurements at the Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig every three years. The last one was in April 2019. The sound level meter used, Series No. 17956, was DKD calibrated by the company Norsonic Tippkemper (DKD - Deutscher Kalibrierdienst “German Calibration Service”) on 11th January 2019.

2.4 Testing

Date	24th September 2020
Operating Testing Officer	Johann Baume

3 Detailed results

The values of the measured sound reduction index R_S of the joint for the tested filler are plotted against frequency in the data sheets (Annex). Based on EN ISO 717 - 1, this is used to calculate the weighted sound reduction index $R_{S,w}$ of the joint and the spectrum adaptation terms C and C_{tr}, related to joint length l = 1.20 m, for the frequency range 100 Hz to 3,150 Hz.

The diagram includes the maximum sound reduction of the test set-up (related to l = 1.20 m), plotted with a maximum weighted sound reduction index $R_{S,w\,max}$ (C; C_{tr}) = 62 (-1; -5) dB.

The resulting sound reduction indices for joints are within the range for maximum sound insulation; in these cases the values obtained are minimum values. For maximum insulation, it has been corrected by calculation as per EN ISO 10140-1:2016, Annex J. Table 1 lists the weighted sound reduction indices of the different joint designs.

Table 1 Test results, joint depth *d* = 100 mm

Weighted joint sound reduction index $R_{S,w}$ (C; C_{tr}) in dB	Measures taken, comments
≥ 63 (-2; -6)	Width of joint 10 mm, filled with B1 Gun PU Foam
≥ 62 (-1; -5)	Width of joint 20 mm, filled with B1 Gun PU Foam
62 (-1; -5)	Maximum sound insulation

4 Instructions for use

4.1 Application for DIN 4109: 2018

Basis

DIN 4109-1: 2018-01	Sound insulation in buildings - Part 1: Minimum requirements
DIN 4109-2: 2018-01	Sound insulation in buildings - Part 2: Verification of compliance with the requirements by calculation

The weighted joint sound reduction index determined in accordance with Section 3, can be directly used for verification of sound insulation by calculation in accordance with DIN 4109-2.

This sound reduction index of joints is comparable to the linear sound reduction index of a building component with 1 m joint length for each m^2 area and where the sound is transmitted only through the joint.

If the joint is combined with a building component (e.g. window with area S and weighted sound reduction index R) and assuming the building component's area S_1 >> than the area of the joint (w · l, w = joint width), for the associated joint length l and a reference length l_0 = 1 m the resulting sound reduction index $R_{i,w}$ of the i-th-window with installation joint is calculated as follows:

$$R_{i,w} = -10 \cdot \log\left(10^{-\frac{R_w}{10}} + \frac{l \cdot l_0}{S} \cdot 10^{-\frac{R_{s,w}}{10}}\right) \text{dB}$$

For calculation of the total weighted apparent sound reduction index $R'_{w,ges}$ in accordance with DIN 4109-2 Clause 4, the input data obtained from laboratory measurements must be stated in $^{1}/_{10}$ dB. For the implementation of sound transmission via installation joint the resulting weighted joint sound reduction index can then be applied directly to the joint sound insulation. This gives:

$R_{S,w} \geq 63.1$ dB (width of joint 10 mm)
$R_{S,w} \geq 62.6$ dB (width of joint 20 mm)

4.2 Uncertainty of measurement, single number ratings in $^{1}/_{10}$ dB

Basis

EN ISO 12999-1: 2014	Acoustics; Determination and application of measurement uncertainties in building acoustics, part 1: sound insulation (ISO 12999-1: 2014)

The resulting weighted sound reduction index of joints (in $^{1}/_{10}$ dB with measurement uncertainty), determined on the basis of EN ISO 717-1:2013-06 is:

$R_{S,w}$ = 63.1 dB ± 1.2 dB (width of joint 10 mm)

$R_{S,w}$ = 62.6 dB ± 1.2 dB (width of joint 20 mm)

The specified measurement uncertainty is the average standard deviation of laboratory measurements (standard measurement uncertainty σ_R for measurement situation A: Characterisation of a building component by laboratory measurements as per EN ISO 12999-1:2014, Table 3 σ_R = 1.2 dB).

The product declaration must use the integral value of the joint sound reduction index and the spectrum adaptation terms as given in Section 3.

4.3 General remarks:

The method is suitable for comparing construction products designed for sealing purposes (e.g. seals/gaskets, fillers to seal joints). The results can be used to evaluate the sound power ratio τ_e as per EN ISO 12354-3 Annex B. Using the calculated sound reduction of the joint for the calculation of the overall sound reduction is not a substitute for the verification of the overall construction

In practice, e.g. when combining the sound insulation of a window with that of a joint in an existing opening, the following must be taken into account:

a) for physical reasons, the sound reduction index of joints must be corrected by approx. –3 dB in the area of corners and edges;
b) the existing thickness of the window frame profile (joint depth d) must be adapted with a correction between –1 dB and –2 dB.
c) experience shows that the filling of window niches in edges and difficult reachable areas are weak points by handling

From these results, that in practice the measured sound reduction index of joint has to be

a) either corrected by –4 dB or
b) increased by additional sealing with backfilling tape with or without bar or elastic sealant with filling band.

Remark on transfer of the test results

According to the experience of **ift** the following correction reduction has to be applied for a window with an area of 1.82 m^2 and a surrounding joint length of 5.5 m (conditions in laboratory) with the sound reduction index of a window of $R_w \geq 40$ dB:

$R_{w,res} = R_{w,Fe} - 2$ dB

The corrective factor of –2 dB is inapplicable if a sealing is carried out on both sides additionally to the foaming. For windows with $R_w \geq 48$ dB higher reductions may apply.

ift Rosenheim
Laboratory for Building Acoustics
25.09.2020

Joint sound reduction index according to ISO 10140-1

Determination of sound reduction index of joints

Client: Selena Labs Sp.zo.o, 58-200 Dzierzoniow (Poland)

Product designation B1 Gun PU Foam

ROSENHEIM

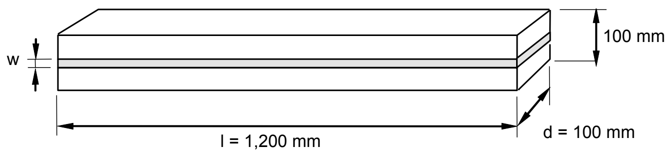
Design of test specimen

1-K polyurethane foam

Joint size

Length l	1,200 mm
Depth d	100 mm
width w	10 mm
Density	20,8 g/l

Drawing of the test arrangement



Test date	24th September 2020
Test length l	1.2 m
Test rig	as per EN ISO 10140-5
Partition wall	Double-leaf concrete wall
Test noise	pink noise
Volumes of test rooms	V_S = 109.9 m³, V_R = 101.3 m³

Maximum joint sound reduction index
$R_{S,w,max}$ = 62 dB (related to test length)

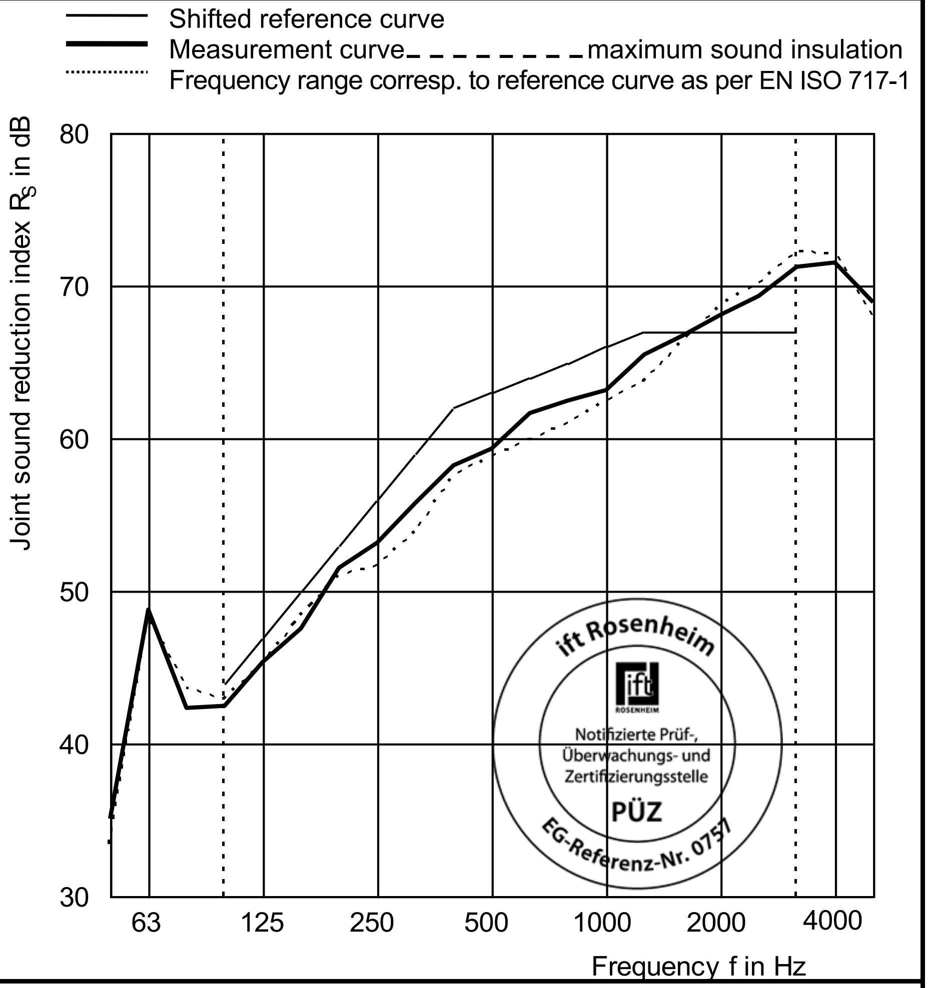
Mounting conditions
Mounting of the cassette in high performance sound insulating element.

Climate in test rooms 22°C / 55 % RH

Static air pressure 959 hPa

f in Hz	R_S in dB
50	≥35,1*
63	≥48,8*
80	≥42,3*
100	≥42,5*
125	≥45,4*
160	≥47,6*
200	≥51,5*
250	≥53,2*
315	≥55,7*
400	≥58,2*
500	≥59,3*
630	≥61,7*
800	≥62,5*
1,000	≥63,1*
1,250	≥65,5*
1,600	≥66,7*
2,000	≥68,1*
2,500	≥69,3*
3,150	≥71,3*
4,000	≥71,5*
5,000	≥68,9*

(* = minimum value)



Rating according to EN ISO 717-1 (in third octave bands):

[$R_{S,w}$ (C; C_{tr}) ≥ 63 (-2; -6) dB] $C_{50\text{-}3,150}$ = -2 dB; $C_{100\text{-}5,000}$ = -1 dB; $C_{50\text{-}5,000}$ = -1 dB

$C_{tr,50\text{-}3,150}$ = -8 dB; $C_{tr,100\text{-}5,000}$ = -6 dB; $C_{tr,50\text{-}5,000}$ = -8 dB

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Dipl. Ing. (FH) Johann Baume

Operating Testing Officer

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Determination of sound reduction index of joints

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Design of test specimen

1-K polyurethane foam

Joint size

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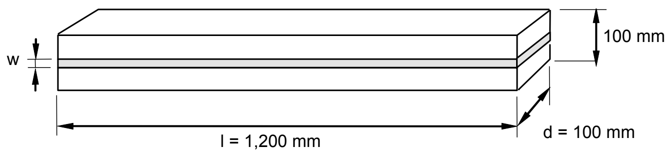
Drawing of the test arrangement



Test date	24th September 2020
Test length l	1.2 m
Test rig	as per EN ISO 10140-5
Partition wall	Double-leaf concrete wall
Test noise	pink noise
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$R_{S,w,max}$ = 62 dB (related to test length)

Mounting conditions
Mounting of the cassette in high performance sound insulating element.

Climate in test rooms 22°C / 55 % RH

Static air pressure 959 hPa

f in Hz	R_S in dB
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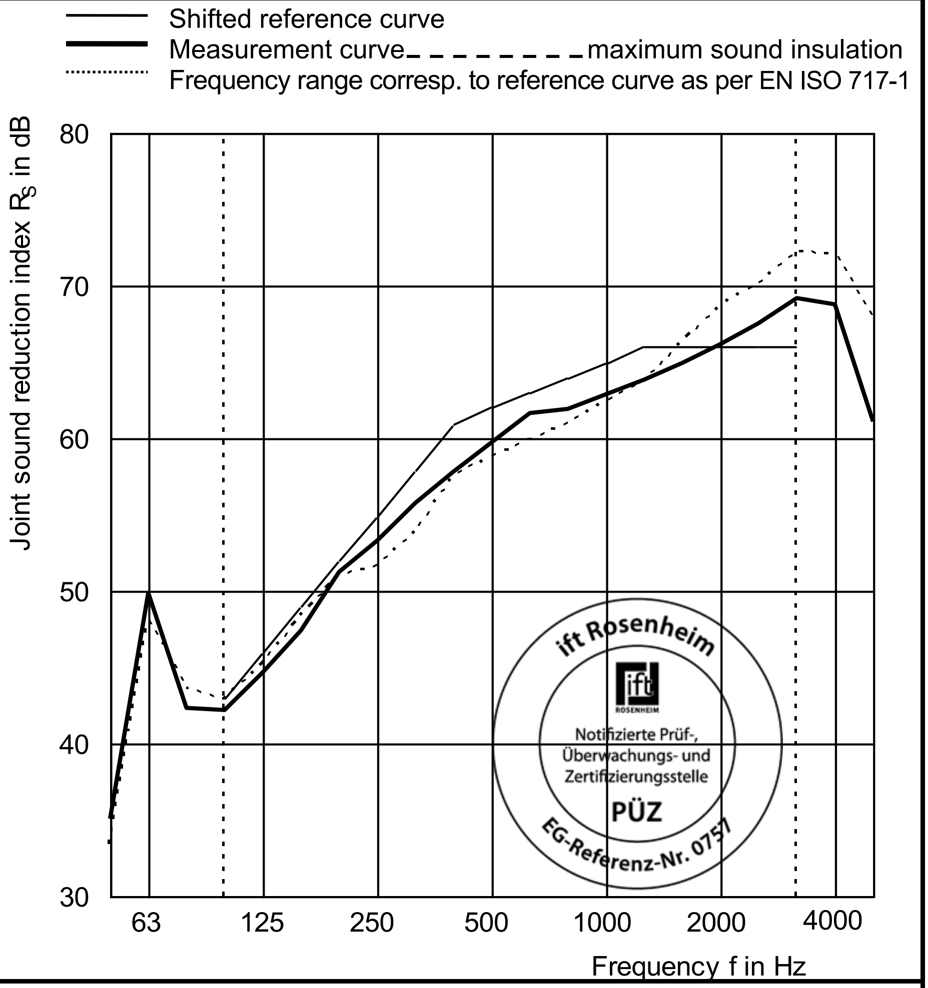
63	≥49,8*
80	≥42,3*
100	≥42,2*
125	≥44,6*
160	≥47,4*
200	≥51,3*
250	≥53,3*
315	≥55,7*
400	≥57,8*
500	≥59,7*
630	≥61,6*
800	≥61,9*
1,000	≥62,9*
1,250	≥63,9*
1,600	≥64,9*
2,000	≥66,1*
2,500	≥67,6*
3,150	≥69,2*
4,000	≥68,8*
5,000	61,1

(* = minimum value)



Rating according to EN ISO 717-1 (in third octave bands):

[$R_{S,w}$ (C; C_{tr}) ≥ 62 (-1; -5) dB] $C_{50\text{-}3,150}$ = -2 dB; $C_{100\text{-}5,000}$ = -1 dB; $C_{50\text{-}5,000}$ = -1 dB

$C_{tr,50\text{-}3,150}$ = -8 dB; $C_{tr,100\text{-}5,000}$ = -5 dB; $C_{tr,50\text{-}5,000}$ = -8 dB

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