

# Evidence of Performance

## Airborne sound insulation of fire protection products

Test Report 13-002389-PR01  
(PB 2-K03-04-en-01)



Client **Hilti Entwicklungsgesellschaft mbH**  
Hiltistr. 6  
86916 Kaufering  
Germany

### Basis

ETAG N°026 Part 2:2008-01  
EN ISO 10140-1 : 2010  
+A1:2012  
EN ISO 10140-2 : 2010  
EN ISO 717-1 : 2013  
Additional  
ASTM E 90-09  
ASTM E 413-10  
13-002389-PR01 (PB 2-K03-04-de-01) dated 09.09.2013

Product	Fire stop foam in metal stud partition
Designation	Hilti fire stop foam CFS-F FX
Dimensions	200 mm x 200 mm x 200 mm
Variants	Filling with fire stop foam Metal stud partition
Wall configuration	Double stud frame, two-part clad

### Instructions for use

This test report serves to demonstrate the sound insulation of a fire protection product based on ETAG 026, Part 2, chapter 2.4.9

Weighted normalized sound level difference of small building elements  $D_{n,e,w}$   
Spectrum adaptation terms C and  $C_{tr}$



$$D_{n,e,w} (C; C_{tr}) = 69 (-2;-7) \text{ dB}$$

### 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 present construction regarding performance and quality.

ift Rosenheim  
25.09.2013

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### 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 abstract.

### Contents

The test report contains a total of 11 pages:

- 1 Object
- 2 Procedure
- 3 Detailed results

Data Sheet (3 Seiten)

## 1 Object

### 1.1 Description of test specimen

#### Product

Product designation	Fire stop foam in metal stud partition
Dimension (d x w x h)	Hilti fire stop foam CFS-F FX
Configuration	200 mm x 200 mm x 200 mm
Wall opening, filled with fire stop foam	
Variants of testing	Wall opening, filled with fire stop foam
	- testing of double stud frame without hole
	- testing with open wall opening 200 mm x 200 mm
	- testing with fire stop foam CFS-F FX

#### Metal stud partition

Manufacturer*	mounted by ift Laboratory for Building Acoustics.
Date of manufacture	13.08.2013
Sampling	By ift Laboratory for Building Acoustics in building supplies store
Dimension (w x h)	1,250 mm x 1,500 mm
Total thickness	155 mm, with gypsum plasterboard facing strips to achieve 200mm depth of opening
Configuration	2 x 12.5 mm GKF
	50 mm metal stud frame, mineral fibre insulation
	40 mm
	5 mm Air
	50 mm metal stud frame, mineral fibre insulation
	40 mm
	2 x 12.5 mm GKF
Lippings	3 layers of gypsum plasterboard facing strips of 12.5 mm
Stud frame	Stud frame made of 50 mm C-wall section (CW 50x50x06)
Cladding	Rigips Vario RF 12.5
Cavity insulation	Clamped between stud frame
Type of mineral wool boards	ISOVER Protect BSP 40

#### Penetration

Clear opening	200 mm x 200 mm
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The description is based on inspection of the test specimen at ift Laboratory for Building Acoustics. Item designations / numbers as well as material specifications were provided by the client. Additional data provided by the client are marked with \*.

## 1.2 Mounting to test rig

Test rig	Window test rig „Z-Wall“ with suppressed flanking transmission acc. to EN ISO 10140-5: 2010; the test rig includes a mounting frame with a continuous acoustic break which is sealed in the test opening with closed-cell permanently resilient sealant.
Mounting of test specimen	by <b>ift</b> Laboratory for Building Acoustics and employees of the client.
Mounting conditions	Test specimen mounted to test opening and sealed on both sides with plastic sealant
Sealing	Opening was filled with fire stop foam
Drying time	Rendering of the gypsum plasterboards was not necessary because the opening was in a board (without joints).

## 1.3 Representation of test specimen

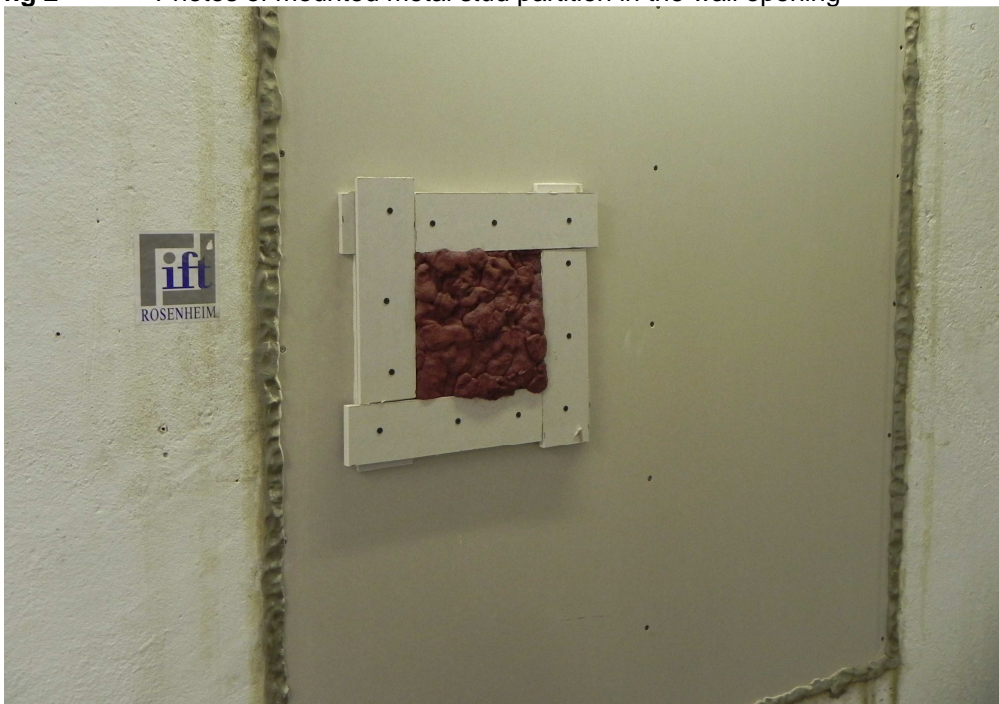
The structural details were examined solely on the basis of the characteristics to be classified.



**fig 1** Photos of mounted metal stud partition in test rig, taken by **ift** Laboratory for Building Acoustics



**fig 2** Photos of mounted metal stud partition in the wall opening



**fig 3** Photos of mounted metal stud partition, Wall opening filled with fire stop foam CFS-F FX

## 2 Procedure

### 2.1 Sampling

Sampling	The samples were selected by the client
Quantity	1 Box
Manufacturer	Hilti AG
Manufacturing plant	Hilti factory 4a
Charge number	0012304401 01/2014
Responsible for sampling	Mr. Schulze
Delivery at ift	14.8.2013 by the client
ift registration number	35327

### 2.2 Method/s

#### Basis

- ETAG N°026, Part 2:2008 Guideline for european technical approval of fire and fire sealing products
- EN ISO 10140-1:2010 + A1 : 2012 Acoustics; Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products (ISO 10140-1:2010+Amd.1:2012)
- 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 10140-1:2012-05, DIN EN ISO 10140-2:2010-12 and DIN EN ISO 717-1 : 2013-06

#### Additional basis

ASTM E 90-09 Standard test method for laboratory measurement of airborne sound transmission loss of building partitions and elements

#### Boundary conditions

As specified by the standard. As set out by ETAG 026 Part 2 Clause 2.4.9 sound insulation must be tested as per EN ISO 140-10 and evaluated in accordance with EN ISO 717.

The standards EN ISO 140-10 and EN ISO 140-3 were superseded by the standard EN ISO 10140-2 in 2010. The test methods of EN ISO 10140 and EN ISO 140 are identical.

Upon request by the client additional evaluations of the STC were carried out in accordance with ASTM E 413-10.



Deviation	The linear joint-related flow resistance of the insulating material was not determined.
Test noise	Pink noise
Measuring filter	One-third-octave band filter
Measurement limits	
Low frequencies	The dimensions of the receiving room were smaller than recommended 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 10140-4: 2010 Clause 4.3.
Maximum sound insulation	The difference between sound insulation and maximum sound insulation of the test setup is partly smaller than 15 dB. The measured sound insulation was corrected by calculation as per EN ISO 10140-2:2010 Annex A. The graphs presented in the Annex include maximum sound insulation.
Measurement of reverberation time	Arithmetical mean: 6 measurements each of 2 loudspeaker positions with rotating microphones (total of 12 measurements).
Measurement equation A	$A = 0,16 \cdot \frac{V}{T} \text{ m}^2$
Measurement of sound level difference	Minimum of 2 loudspeaker positions and rotating microphones.
Measurement equation	$R = L_1 - L_2 + 10 \cdot \lg \frac{S}{A} \text{ dB}$
Measurement equation $D_{n,e}$	$D_{n,e} = L_1 - L_2 + 10 \cdot \lg \frac{n \cdot A_0}{A} \text{ in dB}$

#### KEY

A	Equivalent absorption area in m <sup>2</sup>
L <sub>1</sub>	Sound pressure level source room in dB
L <sub>2</sub>	Sound pressure level receiving room in dB
R	Sound reduction index in dB
D <sub>n,e</sub>	Normalized sound level difference of small building elements in dB
T	Reverberation time in s
V	Volume of receiving room in m <sup>3</sup>
S	Testing area of the specimen in m <sup>2</sup>
A <sub>0</sub>	Reference absorption area (10 m <sup>2</sup> )
n	Number of units

### 2.3 Prüfmittel

Device	Type	Manufacturer
Integrating sound meter	Type Nortronic 121	Norsonic-Tippkemper
Microphone preamplifiers	Type 1201	Norsonic-Tippkemper
Microphone unit	Type 1220	Norsonic-Tippkemper
Calibrator	Type 1251	Norsonic-Tippkemper
Dodecahedron loudspeakers	Own production	-
Amplifier	Type E120	FG Elektronik
Rotating microphone boom	Own production / Type 231-N-360	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 2013. The sound level meter used, Series No. 31423, was DKD calibrated by the company Norsonic Tippkemper (DKD - Deutscher Kalibrierdienst "German Calibration Service") on 21 January 2013.

### 2.4 Testing

Date	14th of August 2013
Operating testing officer	Bernd Saß

## 3 Detailed results

The values of the measured normalized sound level difference of small building elements of the tested specimen are plotted as a function of frequency in the annexed data sheet and tabled.

As per EN ISO 717-1 the weighted sound reduction index  $R_w$  and/or the weighted normalized sound level difference  $D_{n,e,w}$  and the spectrum adaptation terms  $C$  and  $C_{tr}$  are evaluated, see table 1. Additional to the rating according to EN ISO 717-1 a weighting according to ASTM E

413-10 was carried out. The Sound Transmission Class STC according to ASTM E 413-10 for the frequency range from 125 Hz up to 4000 Hz was calculated.

**Table 1** Results of sound insulation tests

Data-sheet no	Record no.	Component	Test standard / Results in dB / Reference area		
			EN ISO 10140-2	EN ISO 10140-2	E 413-10
			$D_{n,e,w} (C; C_{tr})$	$R_w (C; C_{tr})$	STC
			$A_0 = 10 \text{ m}^2$	$S = 1,88 \text{ m}^2$	$S = 1,88 \text{ m}^2$
1	Z2	Metal stud partition without penetration	-	61 (-2;-7)	61
2	Z7	Measurement with wall opening	29 ( 0; 0)	22 ( 0; 0)	22
3	Z8	Measurement with fire stop foam CFS-F FX	69 (-2;-7)	61 (-1;-6)	62

This test report is not an evidence of suitability as per DIN 4109: 1989-11.  
A calculated value is not indicated.

ift Rosenheim  
Laboratory for Building Acoustics  
25.09.2013



# Sound reduction index according to ISO 10140 - 2

Laboratory measurements of airborne sound insulation of building elements

Client: Hilti Entwicklungsgesellschaft, 86916 Kaufering

Product designation Hilti fire stop foam CFS-F FX



## Design of test specimen

2 x 12.5 mm GKF  
50 mm Metal stud frame CW 50 with  
40 mm mineral wool  
5 mm Luft  
50 mm Metal stud frame CW 50 with  
40 mm mineral wool  
2 x 12.5 mm GKF

Total thickness 155 mm

Test date 14th of August 2013  
Test surface S 1.25 m x 1.50 m = 1.88 m<sup>2</sup>  
Test rig as per EN ISO 10140-5  
Partition wall Double-leaf concrete wall, insert frame  
Test noise pink noise  
Volumes of test rooms  $V_S = 104 \text{ m}^3$   
 $V_R = 67.5 \text{ m}^3$

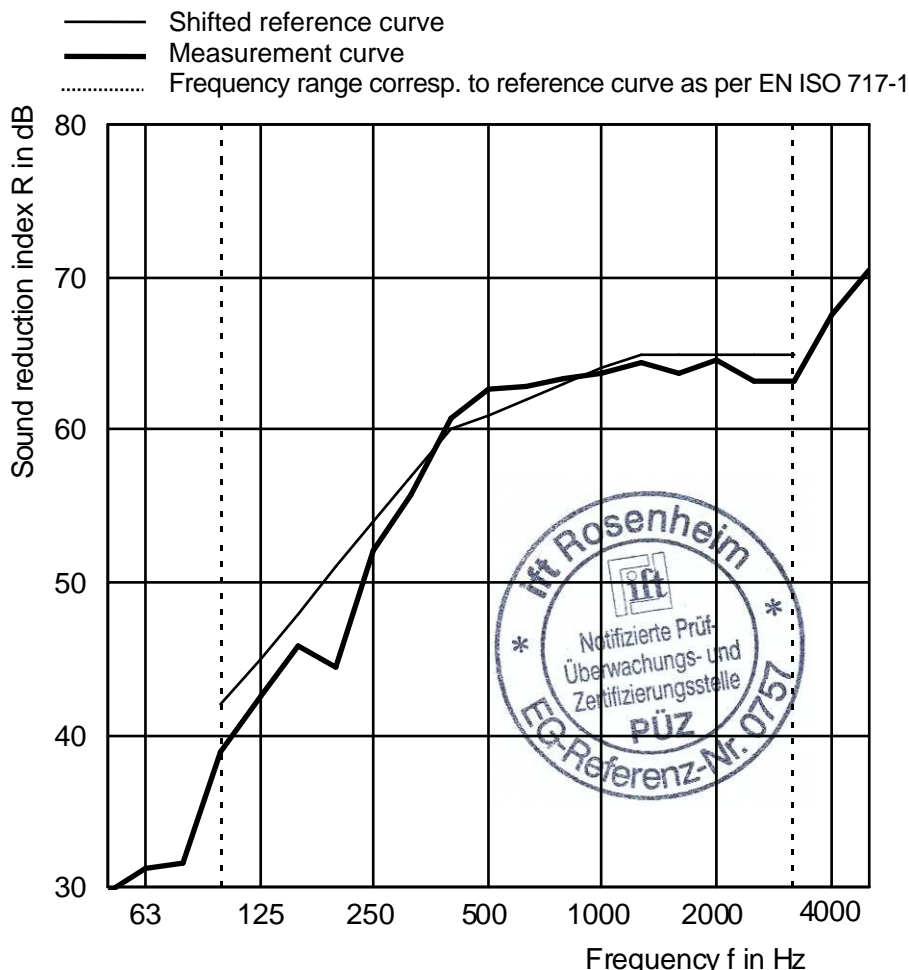
Maximum sound reduction index  
 $R_{w,max} = 62 \text{ dB}$  (related to test surface)

Mounting conditions  
Unit inserted into a test opening closed with a  
partition wall element.

Climate in test rooms 22°C / 50% RF / 965 hPa

## Metal stud partition without hole

f in Hz	R in dB
50	29.7
63	31.2
80	31.6
100	39.0
125	42.6
160	45.8
200	44.5
250	52.1
315	55.8
400	60.8
500	62.7
630	62.9
800	63.4
1,000	63.7
1,250	64.3
1,600	63.7
2,000	64.6
2,500	63.2
3,150	63.2
4,000	67.5
5,000	70.5



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

$R_w (C; C_{tr}) = 61 (-2; -7) \text{ dB}$   
 $C_{50-3,150} = -4 \text{ dB}; C_{100-5,000} = -1 \text{ dB}; C_{50-5,000} = -3 \text{ dB}$   
 $C_{tr,50-3,150} = -13 \text{ dB}; C_{tr,100-5,000} = -7 \text{ dB}; C_{tr,50-5,000} = -13 \text{ dB}$

Test report no.: 13-002389-PR01 (PB 2-K03-04-en-01)

Page 9 of 11

Data Sheet 1, Record no. Z2

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25.09.2013

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Normalized sound level difference acc. to ISO 10140 - 2  
Laboratory measurements of airborne sound insulation of building elements

Client: Hilti Entwicklungsgesellschaft, 86916 Kaufering

Product designation Hilti fire stop foam CFS-F FX



**Design of test specimen**

2 x 12.5 mm GKF  
50 mm Metal stud frame CW 50 with  
40 mm mineral wool  
5 mm Luft  
50 mm Metal stud frame CW 50 with  
40 mm mineral wool  
2 x 12.5 mm GKF

Test date 14th of August 2013  
Reference absorption area  $n \times A_0 = 10 \text{ m}^2$  (n=1)  
Test rig as per EN ISO 10140-5  
Partition wall Double-leaf concrete wall, insert frame  
Test noise pink noise  
Volumes of test rooms  $V_S = 104 \text{ m}^3$   
 $V_R = 67.5 \text{ m}^3$

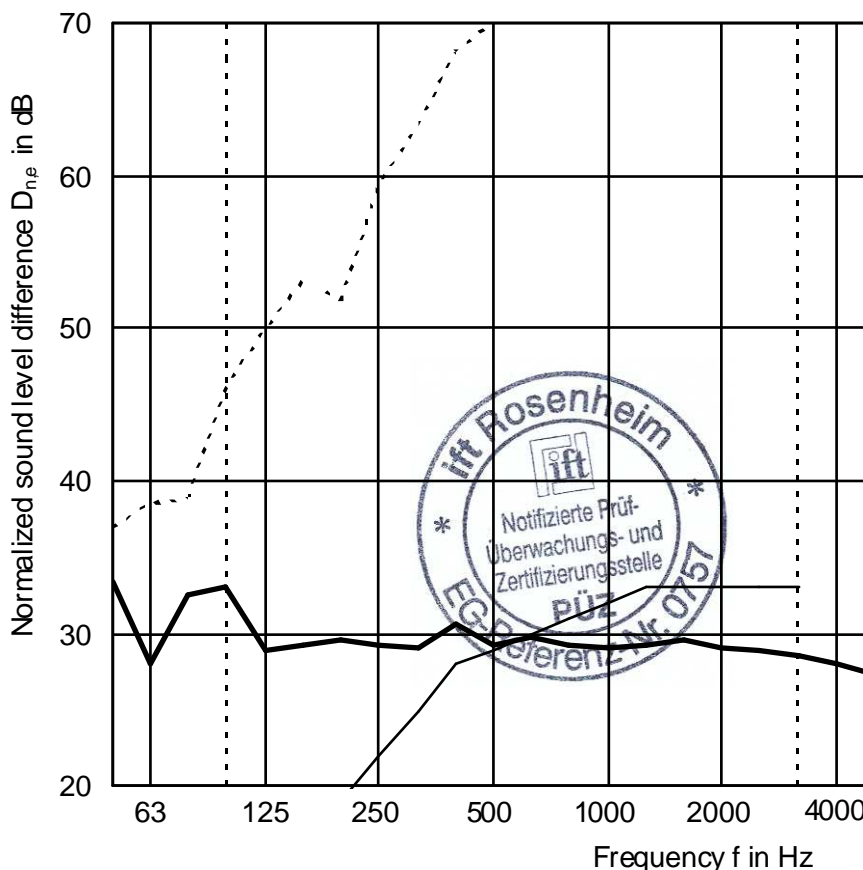
**Measurement with wall opening 200 mm x 200 mm, Wall facing to achieve 200 mm**

Maximum normalized sound level difference  
 $D_{n,e,w,max} = 68 \text{ dB}$  (related to  $A_0 = 10 \text{ m}^2$ )  
Mounting conditions  
Unit inserted into a test opening closed with a  
partition wall element.  
Climate in test rooms 22°C / 50% RF / 965 hPa

f in Hz	$D_{n,e}$ in dB
50	> 33.4
63	28.0
80	32.6
100	33.1
125	28.9
160	29.3
200	29.6
250	29.2
315	29.1
400	30.6
500	29.3
630	29.7
800	29.3
1,000	29.1
1,250	29.3
1,600	29.6
2,000	29.1
2,500	28.9
3,150	28.5
4,000	28.0
5,000	27.3

> = Minimum value

— Shifted reference curve  
— Measurement curve - - - Max. normalized sound level difference  
..... Frequency range corresp. to reference curve as per EN ISO 717-1



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

$D_{n,e,w} (C; C_{tr}) = 29 (0; 0) \text{ dB}$   
 $C_{50-3,150} = 0 \text{ dB}; C_{100-5,000} = 0 \text{ dB}; C_{50-5,000} = 0 \text{ dB}$   
 $C_{tr,50-3,150} = 0 \text{ dB}; C_{tr,100-5,000} = 0 \text{ dB}; C_{tr,50-5,000} = 0 \text{ dB}$

Test report no.: 13-002389-PR01 (PB 2-K03-04-en-01)

Page 10 of 11

**Data Sheet 2, Record no. Z7**

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25.09.2013

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Operating testing officer

# Normalized sound level difference acc. to ISO 10140 - 2

## Laboratory measurements of airborne sound insulation of building elements

Client: Hilti Entwicklungsgesellschaft, 86916 Kaufering

Product designation Hilti fire stop foam CFS-F FX



### Design of test specimen

2 x 12.5 mm GKF  
50 mm Metal stud frame CW 50 with 40 mm mineral wool  
5 mm Luft  
50 mm Metal stud frame CW 50 with 40 mm mineral wool  
2 x 12.5 mm GKF

Test date 14th of August 2013  
Reference absorption area  $n \times A_0 = 10 \text{ m}^2$  ( $n=1$ )  
Test rig as per EN ISO 10140-5  
Partition wall Double-leaf concrete wall, insert frame  
Test noise pink noise  
Volumes of test rooms  $V_S = 104 \text{ m}^3$   
 $V_R = 67.5 \text{ m}^3$

Maximum normalized sound level difference  
 $D_{n,e,w,\max} = 68 \text{ dB}$  (related to  $A_0 = 10 \text{ m}^2$ )

### Wall facing to achieve 200 mm

Mounting conditions  
Unit inserted into a test opening closed with a partition wall element.

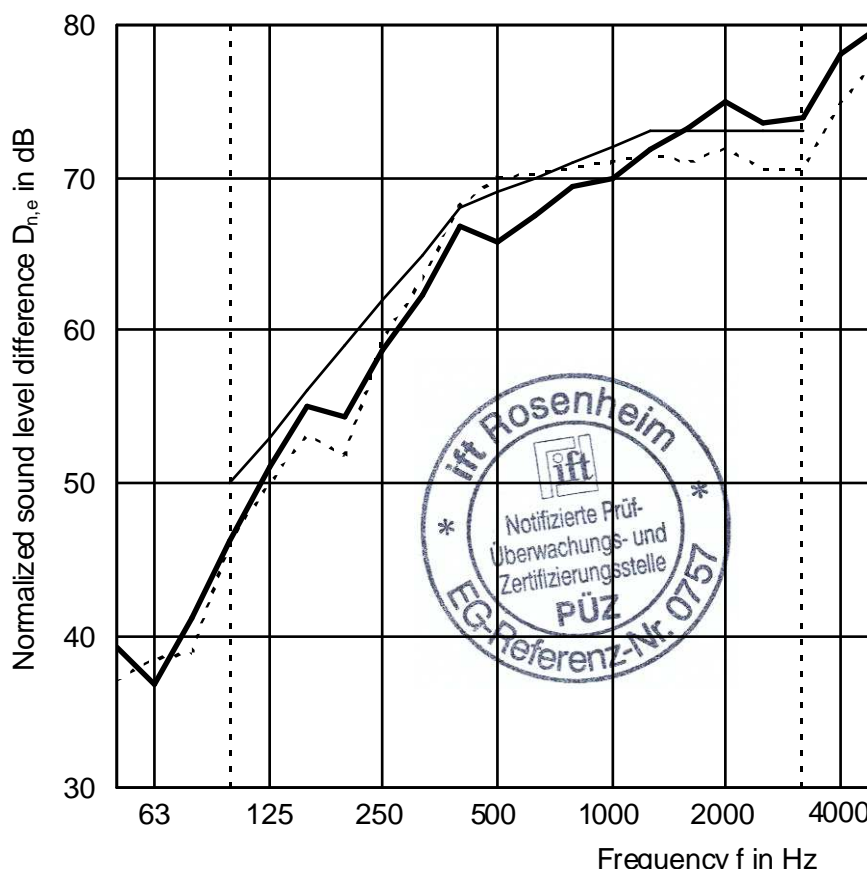
### Measurement with fire stop foam

Climate in test rooms 22°C / 50% RF / 965 hPa

f in Hz	$D_{n,e}$ in dB
50	> 39.2
63	> 36.9
80	> 41.2
100	> 46.2
125	> 51.0
160	> 55.1
200	> 54.3
250	> 58.6
315	> 62.3
400	> 66.8
500	65.8
630	67.5
800	> 69.4
1,000	> 69.9
1,250	> 71.9
1,600	> 73.3
2,000	> 75.0
2,500	> 73.5
3,150	> 74.0
4,000	> 78.0
5,000	> 79.8

> = Minimum value

— Shifted reference curve  
— Measurement curve  
- - - - Max. normalized sound level difference  
..... Frequency range corresp. to reference curve as per EN ISO 717-1



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

$D_{n,e,w} (C; C_{tr}) = 69 (-2; -7) \text{ dB}$   
 $C_{50-3,150} = -4 \text{ dB}; C_{100-5,000} = -1 \text{ dB}; C_{50-5,000} = -3 \text{ dB}$   
 $C_{tr,50-3,150} = -13 \text{ dB}; C_{tr,100-5,000} = -7 \text{ dB}; C_{tr,50-5,000} = -13 \text{ dB}$

Test report no.: 13-002389-PR01 (PB 2-K03-04-en-01)

Page 11 of 11

Data Sheet 3, Record no. Z8

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