Evidence of Performance

Air permeability of installation foam

Test Report
No. 16-003531-PR01
(PB-K05-02-en-01)

Client	Bloem Sealants b.v. Westvlietweg 69 2495 AA Den Haag Netherlands
Product	Installation foam (in-situ foam)
Designation	1K-PU gun foam FLEXOFOAM
Dimension	Joint cross section 20 x 60 mm²
Material	One-component, moisture curing PU-based installation foam
Special feautres	The air permeability of the installation foam was determined in an "ideal" joint and in new condition on the basis of DIN 18542, Clause 7.2. The results cannot be used to demonstrate air tightness of linear connecting joints (gunned with foam) in practical end-use applications.

Result	Air permeability in new condition
	$a < 0.1\ m^3 / [h \cdot m \cdot (daPa)^{2/3}]$
	no measurable air flow

ift Rosenheim
26.10.2016

Wolfgang Jehl, Dipl.-Ing. (FH)
Deputy Head of Testing Department
Building Material & Semifinished Products

Thomas Stefan, Dipl.-Ing. (FH)
Operating Testing Officer
Construction Product Testing

Basis

Test based on DIN 18542 : 1999-01 *), Sealing of outside wall joints with impregnated sealing tapes made of cellular plastics, Clause 7.2, Air permeability *)

Test standard:

EN 12114 : 2000-03

Test report 12-001850-PR01 (PB-K05-02-en-01) dated 4.7.2014

*) See explanations in test report

Representation of test specimen

Instructions for use

This test report serves to demonstrate the above material property.

Validity

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

The effects of weathering and ageing have not been covered.

Notes on publication

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

The cover sheet can be used as an abstract.

Contents

The report comprises a total of 6 pages.

ift Rosenheim GmbH
Theodor-Gietl-Str. 7-9
D-83026 Rosenheim

Kontakt
Tel. +49.8031.261-0
Fax +49.8031.261-290
www.ift-rosenheim.de

1 Object

1.1 Description of test specimen

The description is based on inspection of the test specimen at the **ift** Rosenheim. Item designations/ numbers as well as material specifications were given by the original client.

Product designation	1K-PU gun foam FLEXOFOAM
Material / Base	One-component, moisture curing PU-based installation foam (in-situ foam), colour light yellow
Density	14.5 – 16.5 kg/m^3
Cell structure	Fine to medium sized pores

For more technical details refer to the Technical Data Sheet of the original client.

For testing the installation foam was gunned into a test apparatus composed of square aluminium tubes, the specimens used for testing the air permeability of linear joints in accordance with DIN 18542, Clause8.2 and photo 5. Spacer disks inserted between the square tubes ensured uniform joint width of 20 mm. Joint depth was 60 mm.

3 joints of each 1,000 mm joint length were prepared for the test. After the time specified by the manufacturer to achieve full loading capacity, the installation foam protruding from the joint was cut off on both sides flush with the joint.

1.2 Representation of test specimen

The photographs were taken at the **ift** during testing.

Photo 1 Joints gunned with foam in test apparatus for linear joints in accordance with DIN 18542, mounted on window test rig

2 Procedure

2.1 Sampling

The test specimens were selected by the original client.

Delivered on	21 August 2012, by the original client
Number	3 cans, including discharger and cleaner.
Registration No.	33005/001
Preparation	The installation foam was gunned by the original client of the testing body into the test apparatus on 21 August 2012. During gunning the installation foam, the joint faces and the foam surfaces were wetted with water sprayed from a spray bottle. Prior to the test, the test apparatus including the foamed joints was also stored at standard atmosphere (23 °C, 50 % rel. humidity).

2.2 Method/s

Basis

DIN 18 542 : 2009-07	Sealing of outside wall joints with impregnated sealing tapes made of cellular plastics - Impregnated sealing tapes - Requirements and testing (subtest as per Clause 8.2) Since there is no comparable standard known for the objective of testing this installation foam, the test set arrangement was based on this standard.
EN 12114 : 2000-03 *)	Thermal performances of buildings - Air permeability of building components and building elements - Laboratory test method
Boundary conditions	as per standard specifications

2.3 Test equipment

Window test rig	Device No.: 22200

2.4 Testing

Date/Period	29 August 2012
Test engineer	Thomas Stefan, Dipl.-Ing. (FH)

2.5 Test sequence

2.5.1 Test of air permeability

Illustration 1 below shows the test sequence (pressure steps) according to EN 12114 to determine the air permeability

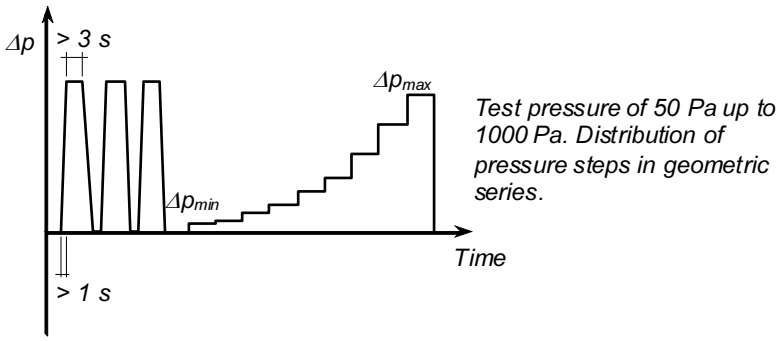


Illustration 1 Test sequence (pressure steps)

The measurement results are used to determine linear air permeability [m³/(hm)] up to a test pressure difference of 1,000 Pa. Leakages of the test arrangement were determined by comparative measurement (zero measurement) during which the joints to be tested were masked air-tight. These leakages were then taken into account for the subsequent air permeability test of the joints. Thus only the air flow through the joints to be tested is determined.

3 Results

3.1 Test of air permeability in new condition

The test record lists the values and diagram 1 and 2 shows the plotted values. Diagram 2 shows also, for orientation, the requirements for evaluation of air permeability of linear joints as per DIN 4108, Part 2, expressed by the air permeability a where a ≤ 0.1 m³ / [h m $(daPa)^{2/3}$].

The measurement results were obtained of joints in new condition with uniform joint widths and smooth, parallel joint faces, i.e. from an "ideal" joint. The effects and changes resulting from weathering and/or ageing, the different nature of the joint faces and any joint movements, have not been taken into account. Thus the results cannot be applied to any linear connecting joints (gunned with foam) in end use applications.

3.2 Test record

Test record air permeability composite joints

Project No.	16-003531-PR01	**File No.**	16-003531
Client	original client		
Basis of test	EN 12114:2000-03 Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method		
Used test equipment	Pst/022200 - LWW-Prüfstand Fensterprüfstand 1		
Test specimen	Test sequence in accordante to DIN18542, 3 joints in cross section im Querschnitt 20 x 60 mm² with 1K-in-situ foam FOMO FLEXpro		
Test specimen No.	33005-001		
Date of test	29.08.2012		
Testing personnal in charge	Thomas Stefan		
Test engineer	Thomas Stefan		

Information to test configuration / Test method

Test method There are no deviations to the test method according standard/basis.

Ambient conditions Temperature 22,1 °C Air humidity 63,6 % Air pressure 968,7 hPa

The ambient conditions are in accordance with the standard requirements.

Testing

Partial water vapour pressure	p_w	1691,363961	Pa
Air tightness laboratory cond. Laborbed.	ρ	1,135409021	kg/m³
Air tightness reference cond.	ρ_0	1,1988	kg/m³

Test according to DIN EN 12114

	Width	x	Height	
Dimension of test specimen	977	x	1200	in mm
	Number		Length	
Joint length	3	x	1000	in mm

PRESSURE

3 pressure pulses with 1100 Pa	X

Flow rate (volume) 1	**Zero measurement (joints covered)**								
Pa	50	73	106	154	224	325	473	688	1000
V in m³/h	*)	*)	*)	*)	*)	*)	*)	*)	*)

*) not measurable, V < 0,06 m³/h

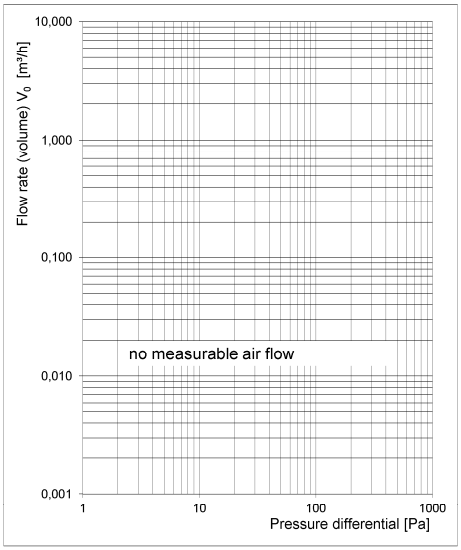
Flow rate (volume) 2	**Joints not covered**								
V in m³/h	*)	*)	*)	*)	*)	*)	*)	*)	*)

*) not measurable, V < 0,06 m³/h

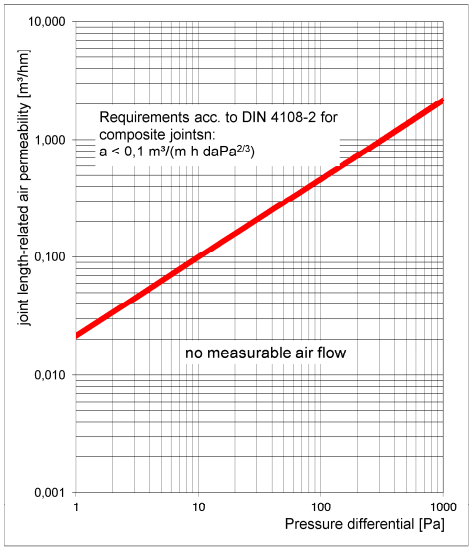
Joint length 3,00 m

Flow rate (volume) 2 - 1	**Air permeability joint**								
Pa	50	73	106	154	224	325	473	688	1000
V in m³/h	*)	*)	*)	*)	*)	*)	*)	*)	*)
V_0 in m³/h	*)	*)	*)	*)	*)	*)	*)	*)	*)
joint length-related in m³/hm	*)	*)	*)	*)	*)	*)	*)	*)	*)

*) not measurable, V < 0,06 m³/h



Graphic 1 Flow rate (volume V_0



Graphic 2 Joint length-related air permeability Q

Results air permeability composite joints

Parameters	Results Value	95%-confidence range	Unit
Air flow rate coefficient C [1)2)]		no measurable air flow	$m^3/(h\ Pa^n)$
Leckageexponent n [2)]		no measurable air flow	--

[1)] Air flow rate through test specimen at a pressure differential of 1 Pa
[2)] C and n after the emperical air permeability equation $V = C \times \Delta p^n$

The composite joint is in terms of DIN 4108-2, Clause 7, requirements a < 0,1 m³/[h m $(daPa)^{2/3}$], air tight

Note:

The test was carried out in an ideal joint. Therefore the material characteristics of the foam was tested .
Thus the results cannot be applied to any linear joints in end use applications.

ift Rosenheim
29.08.2012

Evidence of Performance

Joint sound reduction of filling material

Test Report
No. 16-003531-PR03
(PB Z5/Z6-K05-04-en-01)

ift ROSENHEIM

Client **Bloem Sealants b.v.**
Westvlietweg 69
2495 AA Den Haag
Netherlands

Product 1-K gun foam

Designation FLEXOFOAM

Density 10 mm joint: 19 g/l
20 mm joint: 15 g/l

Specials -/-

Weighted sound reduction index of joints $R_{s,w}$
Spectrum adaptation terms C and C_{tr}

test 1 (10 mm joint width)

$$[R_{s,w}\ (C;\ C_{tr}) \geq 63\ (-1;\ -4)\ \text{dB}]$$

test 2 (20 mm joint width)

$$[R_{S,w}\ (C;C_{tr}) \geq 64\ (-2;\ -5)\ \text{dB}]$$

Determined for 10 and 20 mm joint width

ift Rosenheim
26.10.2016

Dr. Joachim Hessinger, Dipl.-Phys.
Head of Testing Department
Building Acoustics

Andreas Preuss, Dipl.-Ing. (FH)
Head of Laboratory
Building Acoustics

Basis

EN ISO 10140-1 : 2010
+A1:2012
EN ISO 10140-2 : 2010
EN ISO 717-1 : 1996+A1:2006

12-001850-PR06 (PB Z5/Z6-K05-04-en-01) dated 07th of July 2014

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 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 present construction 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 abstract.

Contents

The test report contains a total of 9 pages:

ift Rosenheim GmbH
Geschäftsführer:
Dr. Jochen Peichl
Prof. Ulrich Sieberath

Theodor-Gietl-Str. 7 - 9
D-83026 Rosenheim
Tel.: +49 (0)8031/261-0
Fax: +49 (0)8031/261-290
www.ift-rosenheim.de

Sitz: 83026 Rosenheim
AG Traunstein, HRB 14763
Sparkasse Rosenheim
IBAN: DE90711500000000003822
SWIFT-BIC: BYLADEM1ROS

1 Object

1.1 Description of test specimen

Product	1-K gun foam
Date of manufacturing of test specimen	20.08.2012
Product designation	FLEXOFOAM*
Size	
Length of joint l	1,200 mm
Depth of joint d	100 mm
Width of joint w	10 mm und 20 mm
Joint cover	Without cover
Curing time	11 days
Density	10 mm joint: 19 g/l 20 mm joint: 15 g/l (determined of test elements)

The description is based on inspection of the test specimen at **ift** Laboratory for Building Acoustics. Article designations / numbers as well as material specifications were given by the original client. (Additional data provided by the original client 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 10140-1:2010 + A1:2012 (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. One side of the profiles of the slide-in cassettes is made of concrete whereas the other side is made of aluminium profiles filled with sand. Using these cassettes, a great variety of joints with varying joint widths w can be created (Fig. 1).

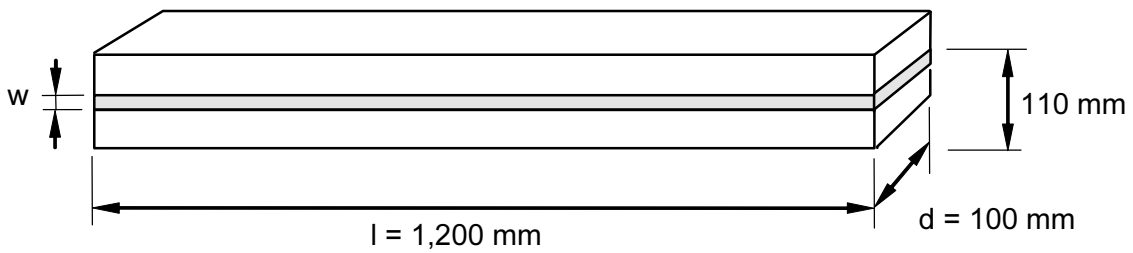


fig 1 slide-in cassettes

These slide-in cassettes were produced by the **ift** Laboratory for Building Acoustics 11 days before the date of test using the filling material to be tested as specified by 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 (Z-wall) 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.

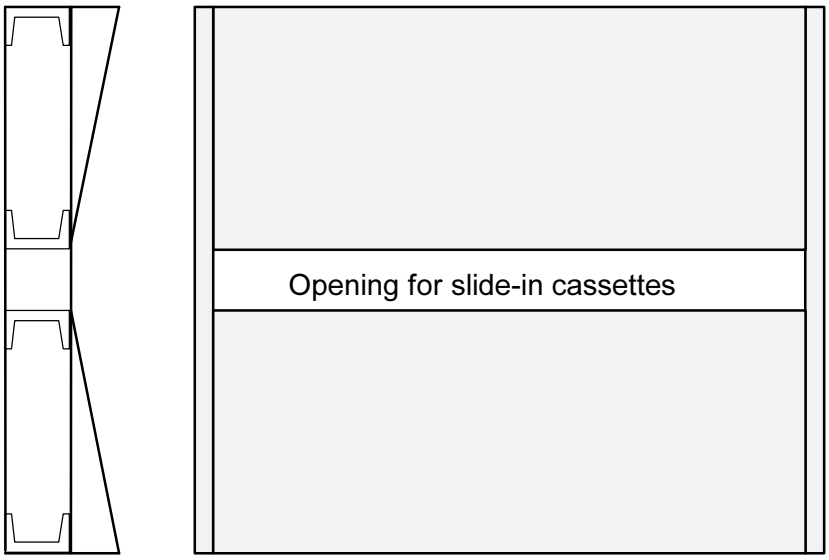


fig 2 Set-up of joint testing apparatus (high performance sound insulating element)

fig 3 Photo of the mounted element with w = 10 mm (taken by **ift** Laboratory for Building Acoustics)

fig 4 Photo of the mounted element with w = 20 mm (taken by **ift** Laboratory for Building Acoustics)

2 Procedure

2.1 Sampling

Sampling	The samples were selected by the original client. The slide-in cassettes were filled by the **ift** Laboratory for Building Acoustics with the filler to be tested according to the instructions of the manufacturer.
Quantity	2
Manufacturer / Manufacturer plant	The manufacturer is known to the ift Rosenheim and would not published in this test report.
Responsible for sampling	The person who was responsible for sampling is known to the ift Rosenheim and would not published in this test report.
Delivery at **ift**	20. August 2012 by the original client via parcel service
ift registration number	32999/001 und 32999/006

2.2 Process

Basis

EN ISO 10140-1:2010 + A1 : 2012	Acoustics; Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products
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: 1996 + A1:2006	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 : 2006-11

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 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 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 (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

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 m² 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 sound reduction index R) and assuming the building component's area S_1 >> than the opening area of the joint (w · l, w = joint width), for the associated joint length l the resulting sound reduction index R_{res} is calculated as follows

$$R_{res} = -10\log\left(10^{-\frac{R}{10}} + \frac{l}{S} \cdot 10^{-\frac{R_S}{10}}\right) \text{ dB}$$

2.3 Test equipment

Device	Type	Manufacturer
Integrating sound meter	Type Nortronic 840	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. 24842, was calibrated by the Dortmund Eichamt (calibration agency) on 20 January 2011. The calibration is valid until 31st of December 2013.

2.4 Testing

Date	31st of August 2012
Operating testing officer	Michael Ewald

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}) = 64 (-2;-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 10140-1:2010/prA1:2012. 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
64 (-2;-5)	Maximum sound insulation
≥ 63 (-1;-4)	Joint width 10 mm, on both sides filled with FLEXOFOAM
≥ 64 (-2;-5)	Joint width 20 mm, on both sides filled with FLEXOFOAM

4 Instructions for use

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 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 this 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
26.10.2016

Joint sound reduction index according to ISO 10140-1

Determination of sound reduction index of joints

Client: **Bloem Sealants b.v.**, 2495 AA Den Haag (Netherlands)

Designation FLEXOFOAM

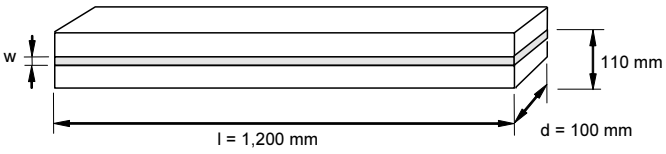
Construction of test specimen

1-K gun foam

Joint size

Length l	1,200 mm
Depth d	100 mm
Width w	10 mm
Density	19 g/l

Drawing of test arrangement



Test date	31st of August 2012
Test length l	1.2 m
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 m³ V_R = 67.5 m³

Maximum joint sound reduction index
$R_{S,w,max}$ = 64 dB (related to test length)

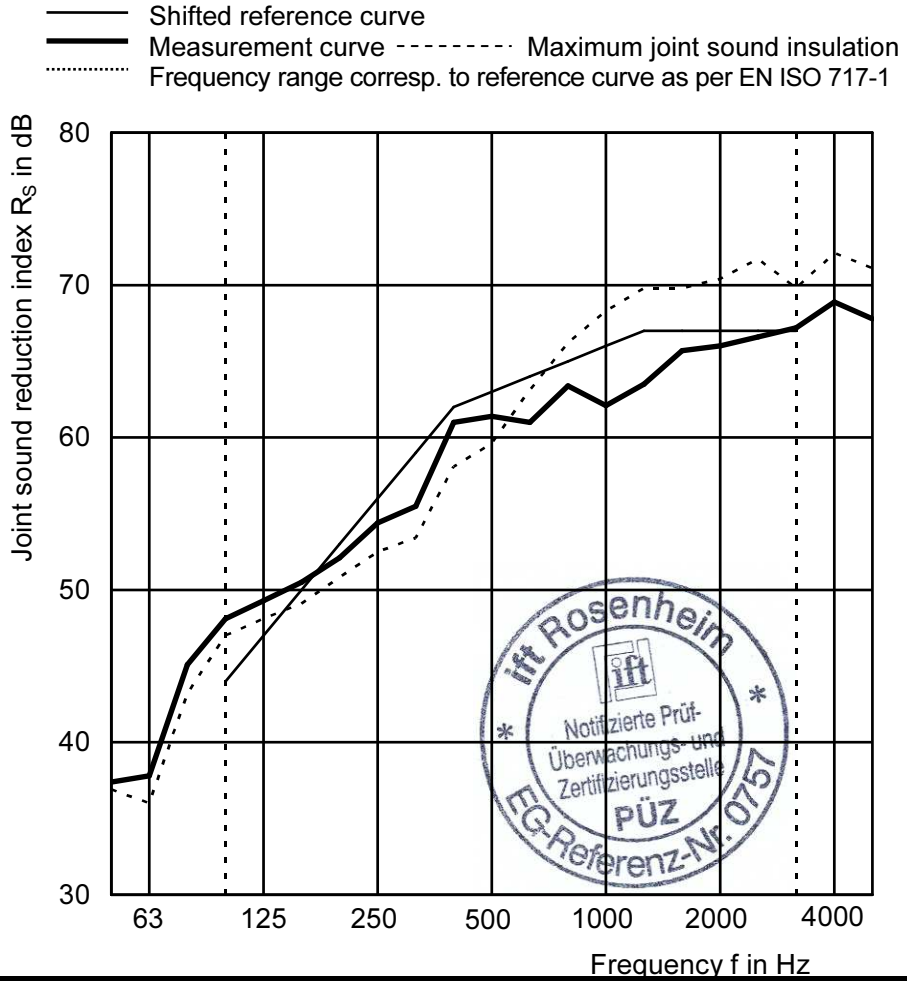
Mounting conditions
Mounting of the cassette in high performance sound insulating element.

Climate in test rooms 21 °C / 55 % RH

Static air pressure 962 hPa

f in Hz	R_S in dB
50	(≥ 37.4)
63	(≥ 37.8)
80	(≥ 45.1)
100	(≥ 48.1)
125	(≥ 49.3)
160	(≥ 50.5)
200	(≥ 52.1)
250	(≥ 54.4)
315	(≥ 55.5)
400	(≥ 61.0)
500	(≥ 61.4)
630	61.0
800	63.4
1,000	62.1
1,250	63.5
1,600	65.7
2,000	66.0
2,500	66.6
3,150	67.2
4,000	68.9
5,000	67.8

(≥ = minimal value)



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

[$R_{S,w}$ (C;C_{tr}) ≥ 63 (-1;-4) dB] $C_{50\text{-}3,150}$ = -1 dB; $C_{100\text{-}5,000}$ = 0 dB; $C_{50\text{-}5,000}$ = -1 dB

$C_{tr,50\text{-}3,150}$ = -8 dB; $C_{tr,100\text{-}5,000}$ = -4 dB; $C_{tr,50\text{-}5,000}$ = -8 dB

ift Rosenheim
Laboratory for Building Acoustics
26. October 2016

Dipl. Ing. (FH) Andreas Preuss
Head of Laboratory

Joint sound reduction index according to ISO 10140-1

Determination of sound reduction index of joints

Client: **Bloem Sealants b.v.**, 2495 AA Den Haag (Netherlands)

Designation FLEXOFOAM

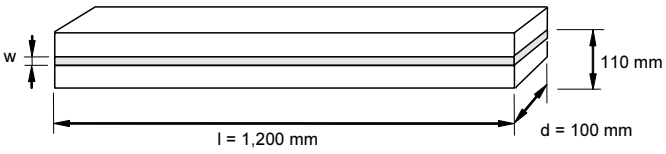
Construction of test specimen

1-K gun foam

Joint size

Length l	1,200 mm
Depth t	100 mm
Width w	20 mm
Density	15 g/l

Drawing of test arrangement



Test date	31st of August 2012
Test length l	1.2 m
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 m³ V_R = 67.5 m³

Maximum joint sound reduction index
$R_{S,w,max}$ = 64 dB (related to test length)

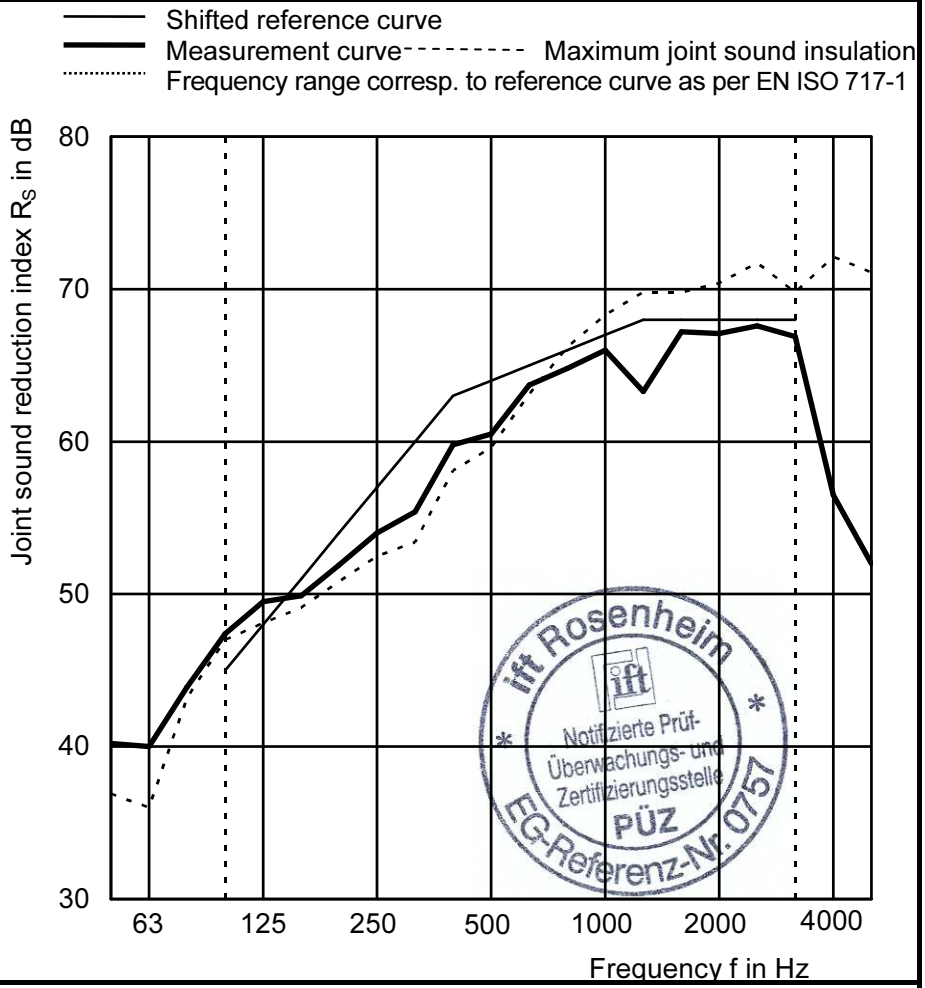
Mounting conditions
Mounting of the cassette in high performance sound insulating element.

Climate in test rooms 21 °C / 55 % RH

Static air pressure 962 hPa

f in Hz	R_S in dB
50	(≥ 40.2)
63	(≥ 40.0)
80	(≥ 43.9)
100	(≥ 47.4)
125	(≥ 49.5)
160	(≥ 49.9)
200	(≥ 51.9)
250	(≥ 54.0)
315	(≥ 55.4)
400	(≥ 59.8)
500	(≥ 60.5)
630	(≥ 63.7)
800	(≥ 64.8)
1,000	66.0
1,250	63.3
1,600	67.2
2,000	67.1
2,500	67.6
3,150	66.9
4,000	56.5
5,000	52.0

(≥ = minimum value)



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

[$R_{S,w}$ (C; C_{tr}) ≥ 64 (-2; -5) dB] $C_{50\text{-}3,150}$ = -2 dB; $C_{100\text{-}5,000}$ = -5 dB; $C_{50\text{-}5,000}$ = -5 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

ift Rosenheim
Laboratory for Building Acoustics
26. October 2016

Dipl. Ing. (FH) Andreas Preuss
Head of Laboratory

Evidence of Performance

Hygrothermal performance of building materials and products
Determination of water vapour permeability as per DIN EN ISO 12572

Test Report
Nor. 16-003531-PR02
(PB-K05-09-en-01)

Client	Bloem Sealants b.v. Westvlietweg 69 2495 AA Den Haag Netherlands
Product	Installation foam (in-situ foam) for composite joints
Designation	1K-PU gun foam FLEXOFOAM
Material base	One-component, moisture curing PU-based installation foam
Note	Test in accordance with DIN EN ISO 12572, test condition set A (drycup)

From measurement as per DIN EN ISO 12572 the values obtained for the product FLEXOFOAM, were as follows

Water vapour resistance factor **μ = 22**

Diffusion equivalent air layer thickness **s_D = 0.4 m** *)

*) for a material thickness of 19 mm

ift Rosenheim
27.10.2016

Wolfgang Jehl, Dipl.-Ing. (FH)
Deputy Head of Testing Department
Building Material & Semifinished Products

Irina Hausstetter, Dipl.-Ing. (FH) Technische Chemie
Operating Product Officer
Building Material & Semifinished Products

Basis

DIN EN ISO 12572 : 2001-09; Hygrothermal performance of building materials and products

Determination of water vapour permeability

Test report 12-001850-PR04 (PB-K05-09-en-02) dated 8.7.2014

Instructions for use

This test report serves to demonstrate the water vapour permeability of building materials and products

Validity

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

Notes on publication

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

The cover sheet can be used as an abstract.

Contents

The report contains a total of 5 pages

ift Rosenheim GmbH
Theodor-Gietl-Str. 7-9
D-83026 Rosenheim

Kontakt
Tel. +49.8031.261-0
Fax +49.8031.261-290
www.ift-rosenheim.de

1 Object

1.1 Description of test specimen

Product	Installation foam (in-situ foam) for composite joints
Manufacturer	original client
Designation	1K-PU gun foam FLEXOFOAM
Basis	One-component, moisture curing PU-based installation foam
Cell structure	Fine to medium sized pores
Density	approx. 15.5 kg/m³
Colour	light yellow
Date of manufacture	September 2012

The description is based on inspection of the test specimen at the **ift**. Item designations / numbers as well as material specifications were given by the original client.

2 Procedure

2.1 Sampling

The specimens were selected by the original client

Number	6
Delivered on	17 September 2012 by the client
Registration No.	33160

2.2 Method/s

Basis

DIN EN ISO 12572 : 2001-09:	Hygrothermal performance of building materials and products. Determination of water vapour permeability
Boundary conditions	as per standard specifications
Deviation	There were the following deviations from the test methods and / or test conditions: Storage at (23 ± 1)°C and (50 ± 5)% r.h. (standard specifications: (23 ± 0.5)°C and (50 ± 3)% r.h.)

2.3 Test equipment

Standard climate chamber	Device No.: 22040
Analytical balance	Device No.: 20757

2.4 Testing

Date/Period	18 September 2012 to 27 September 2012
Test engineer/s	Thomas Breu, Dipl-Ing. (FH)

2.5 Explanation of test method

The test material was delivered as foamed plate by the original client. The test specimen required for testing was prepared at the test body. For that purpose 5 samples with a cross-section dimention of 12 centimeter were retrieved from the foamed plates. The storage of the test specimen was carried out under standard climatic conditions according to DIN EN ISO 291-23/50-2.

Determination of the water vapour diffusion resistance factor μ is based on DIN EN ISO 12572, test conditions "Set A“. For Set A, the test temperature is 23 °C, the molecular sieve in the test cup ensures a relative humidity of 0 %, relative humidity in the test chamber is 50 %. The moisture flow rate was determined perpendicular to the plane of the specimen. The test material was applied to the glass dish and sealed with the sealing compound. 5 samples were tested.

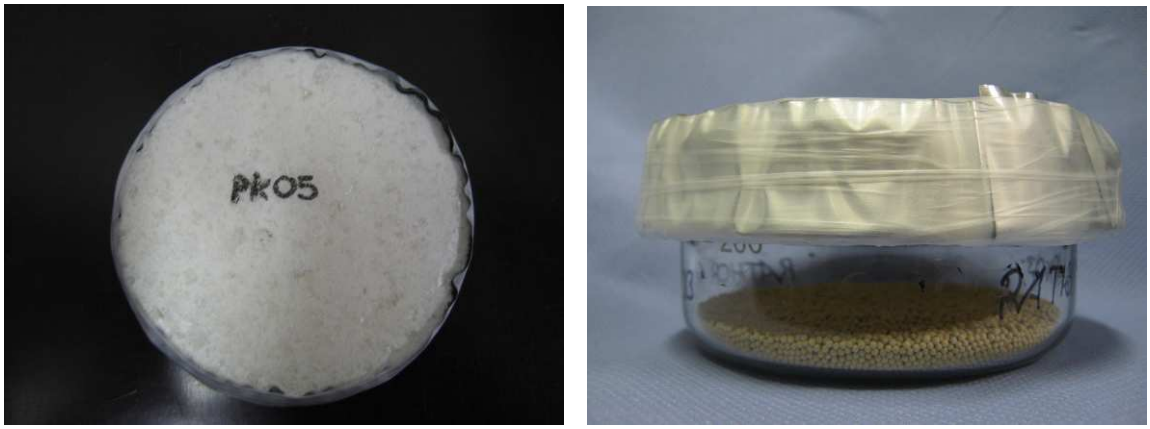


Photo 1 Test set up from the top and lateral

The permeation container were conditioned at controlled atmosphere, (23 ± 1)°C and (50 ± 5)% r. h. The partial water vapour pressure differences produced a diffusion flow through the sample fixed to the template. The changes in mass caused by this diffusion flow were determined at regular intervals during a time period of approx. 2 weeks.

3 Detailed results

The s_d value was computed from the measured values and the ambient parameters as per DIN EN ISO 12572. Fig.2 plots the graphs for 5 samples. Table 1 gives an overview of the calculation of the water vapour diffusion resistance factor (μ-value) and the water vapour diffusion equivalent air layer thickness (s_d-value) for the 5 samples.

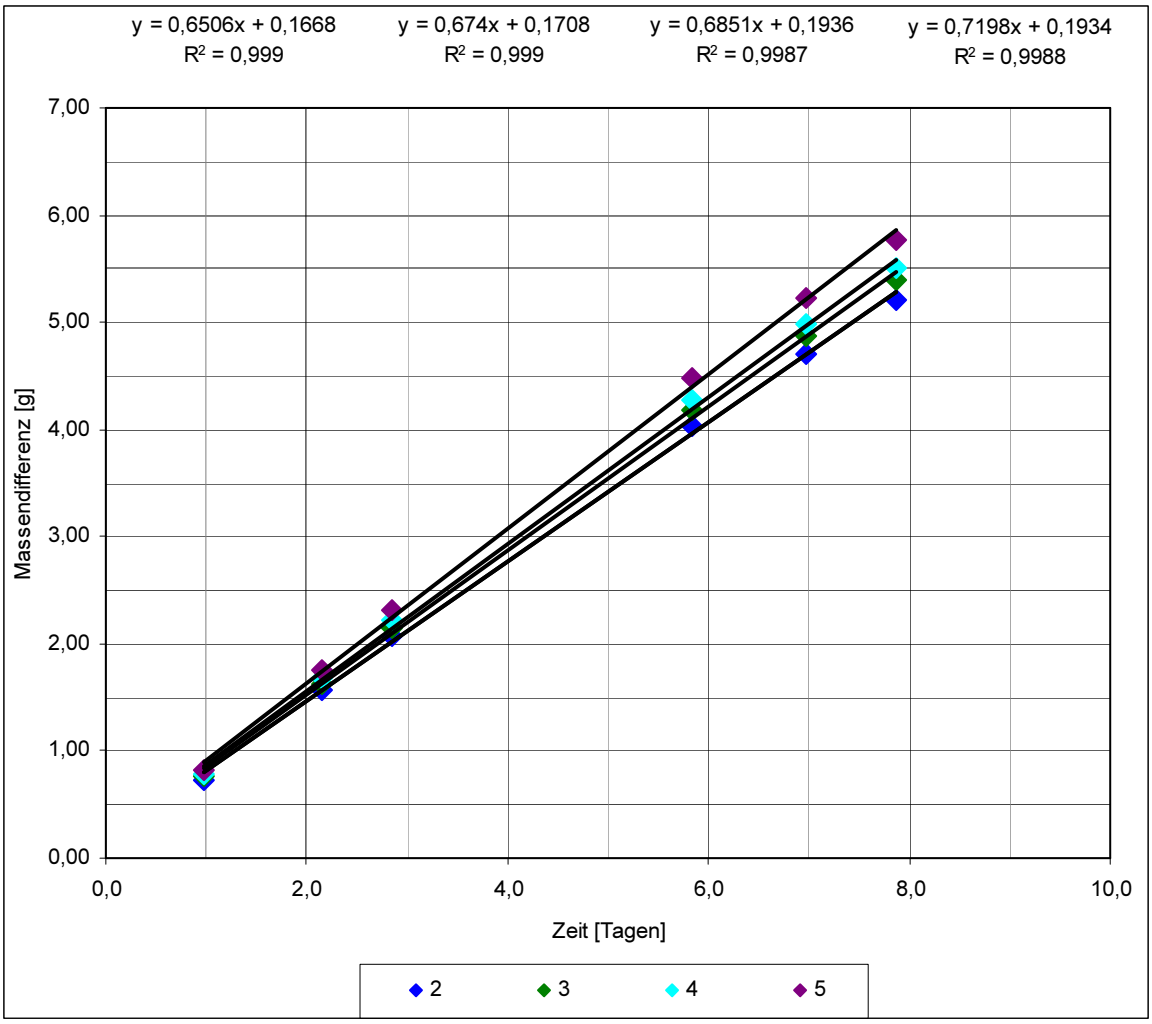


Fig. 2 Plotted graphs of water vapour permeability of 4 samples
*) Test specimen 1 was not considered for the evaluation of results.

Table 1 Analysis of measured results

Test specimen	1*)	2	3	4	5
Thickness in mm	---	19.1	18.9	19.1	18.9
Test area in cm²	---	100.3	103.2	100.1	101.3
G in kg/h	---	2.71×10^{-5}	2.81×10^{-5}	2.85×10^{-5}	3.00×10^{-5}
W in kg/(m² h Pa)	---	1.68×10^{-6}	1.70×10^{-6}	1.77×10^{-6}	1.85×10^{-6}
δ in kg/(m h Pa)	---	3.20×10^{-8}	3.21×10^{-8}	3.39×10^{-8}	3.48×10^{-8}
μ	---	**23.2**	**23.1**	**21.9**	**21.3**
Average value μ	**22**				
Average value s_D in m	**0.4**				

4 Analysis and summary in accordance with DIN EN ISO 12572

Table 2 Summary

Product, designation	Installation foam (in-situ foam) for composite joints, 1K-PU gun foam FLEXOFOAM
Test conditions During the test a ➢ mean temperature of ➢ mean humidity of ➢ mean air pressure of was recorded.	Set A (acc. to table 1 of EN ISO 12572) 23 °C 50 % 959 hPa
Test set-up	EN ISO 12572, Annex D, Methods suitable for mastics and sealants
Conditioning of samples	Storage at (23 ± 1)°C and (50 ± 5)% r. h.
μ	**22**
Mean material thickness	**0.019 m**
s_D	**0.4 m**

ift Rosenheim

Evidence of Performance

Thermal conductivity

Test Report
No. 16-003531-PR04
(PB-K04-06-en-01)

Client	Bloem Sealants b.v. Westvlietweg 69 2495 AA Den Haag Netherlands
Product	Polyurethan – in-situ foam
Designation	FLEXOFOAM
Performance-relevant product details	Material Polyurethane – in-situ foam injecting fluid isobutane, propane, dimethyl ether density in kg/m³ 16.8 thickness in mm approx. 50 application 1K-gun foam for infilling of compo-site joints
Conditioning	In accordance to DIN 18159-1:1991: 6 weeks at 23 °C / 50 % relative air humidity

Results

Thermal conductivity

λ_{10} = 0.035 W/(m·K) *

- The measured value according to EN 12667 was determined on a single sample and does not represent a declared or designed value according to DIN V 4108-4. The test specimen was tested in non aged condition.

ift Rosenheim
02.11.2016

Manuel Demel
Deputy Head of Testing Department
Building Physics

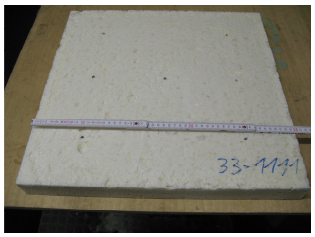
Konrad Huber, Dipl.-Ing. (FH)
Operating Testing Officer
Building Physics

Basis *)

EN 12667:2001-01
*) and the equivalent national versions (e. g. DIN EN)

Test report 12-001850-PR08 (PB-K04-06-de-01) dated 1.7.2014

Representation



Instruction for use

This test report serves to demonstrate the declared value of the equivalent thermal conductivity λ.

The national regulations have to be observed for the building supervisory approval proof.

Validity

The data and results given relate solely to the tested and described specimen. This test/ evaluation does not allow any statement to be made on any further characteristics relevant to performance and quality of the present construction.

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 report contains a total of 5 pages and Annex (1 page).

ift Rosenheim GmbH
Theodor-Gietl-Str. 7-9
D-83026 Rosenheim

Kontakt
Tel. +49.8031.261-0
Fax +49.8031.261-290
www.ift-rosenheim.de

Test Report. 16-003531-PR04 (PB-K04-06-en-01) dated 02.11.2016
Client: Bloem Sealants b.v., 2495 AA Den Haag, (Netherlands)

1 Object

1.1 Description of test specimen

Product	Polyurethane – in-situ foam
Manufacturer	Original client
Date of manufacture *)	5.9.2012
Product designation	FLEXOFOAM
Designation	33-1111
Application	1K- gun foam for infilling of composite joints
Material	Polyurethane – in-situ foam
Injecting fluid	Isobutane, propane, dimethyl ether
Thickness	Approx. 50 mm
Density	Approx. 16.8 kg/m^3
Width in mm	500
Length in mm	500
Special features	--

The description is based on information provided by the original client and inspection of the test specimen at the **ift** (item designations / numbers as well as material specifications were provided by the original client unless stated *"**ift**-checked"*).

Test specimen representations are documented in the Annex "Representation of product/test specimen". The design details were examined solely on the basis of the characteristics / performance to be classified. The drawings are based on unchanged documentation provided by the original client unless stated otherwise; the photographs were taken by the ift Rosenheim unless stated otherwise.

1.2 Sampling

The below sampling data were provided to the **ift**:

Sampling by: original client

Verification: A sampling report has not been provided to the **ift**. The test specimens were manufactured by the original client.

Delivered on 17.09.2012

ift specimen No.: 12-001850-PK08 / WE: 33157-001, WE: 33157-002

2 Procedure

2.1 Basis *) referring to methods

EN 12667:2001-01
Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance.

*) and the equivalent national versions, e. g. DIN EN

2.2 Brief description of procedure

Measurement of thermal resistance using the guarded hot plate apparatus

For thermal resistance measurement a guarded hot plate apparatus (two-specimen apparatus or single-specimen apparatus) was used. The detailed results show the method used for this test.
The two methods are based on measuring the heat flow generated by the temperature difference that is transferred through one or two test specimens in the steady state.
For the two-specimen method a central heating unit is sandwiched between two nearly identical test specimens. The heat flow is transferred through the test specimens to separate cooling units. The heat flow rate is obtained in measuring the power input to the heating unit in the metering section.
For the single specimen method the second specimen is replaced by a combination of a piece of insulation and a guard plate. A zero temperature-difference is then established across this combination. Due to the fact that the properties of the insulating material are known this method can also be used to determine the heat flow rate through the test specimen.
The result provided by the two methods is the thermal resistance computed from the heat flow, the temperature difference and the area through which the heat flows.

Determination of thermal transmittance

Thermal transmittance is determined from the thermal resistance in the steady state and the thermal surface resistance values.

Test Report. 16-003531-PR04 (PB-K04-06-en-01) dated 02.11.2016
Client: Bloem Sealants b.v., 2495 AA Den Haag, (Netherlands)

3 Detailed results

Mesuring of the thermal resistance with the guarded hot plate apparatus

Project-Nr. 16-003531-PR04 **File No.** 16-003531
Basis of the testings EN 12667:2001-01
Thermal performance of building materials and products. Determination of thermal resistance by
Used testing epuipment Pst/022001 - Plattengerät 2 PC
Specimen Thermal conductivity Lambda - Measurement hot plate apparatus - variant 1

Registration number 33157-001, 33157-002
Date of Testing 24.10.2012
Accountable Testing Konrad Huber
Testing personnel Konrad Huber

Informations to the testing procedure

Type of guarded hot	The measurement was performed with a guarded hot plate apparatus with two specimen.
Deviations:	There were no deviations from the test methods and/or test conditions.

Comments:	6 weeks conditioning at 23°C and 50% rel. air humidity

Test specimen informations

Specimen orientation:	vertical
Heat flow direction:	horizontal

Characteristic values of materials before testing

Symbol	Description	Value	Unit
l	Length	0,500	m
b	Width	0,500	m
d	Thickness	0,049	m
m	Mass	207,40	g
$\Delta m_{Vorklima}$	Mass change by pre-conditioning	-0,65	g
$\Delta m/m_{Vorklima}$	rel. Mass change during the test	-0,3	%
ρ	Density	16,84	kg/m³

Characteristic values of materials after testing

Symbol	Description	Value	Unit
l	Length	0,500	m
b	Width	0,500	m
d	Thickness	0,049	m
m	Mass	207,45	g
$\Delta m_{Prüfung}$	Mass change by pre-conditioning	0,05	g
$\Delta m/m_{Prüfung}$	rel. Mass change during the test	0,02	%
ρ	Density	16,84	kg/m³

Detailed results

Table: Detailed results of the guarded hot plate apparatus

Symbol	Description	Value	Unit
A	Metering section	500000	mm ²
Φ	Heat flow	5,3	W
θ_i	Mean surface temperature on the inner (warm) side	17,7	°C
θ_e	Mean surface temperature on the outer (cold) side	2,5	°C
θ_m	Mean temperature	10,1	°C
Δθ	Mean temperature diference	15,2	K
R	Thermal resistance	1,423	(m²·K)/W

Test Report. 16-003531-PR04 (PB-K04-06-en-01) dated 02.11.2016
Client: Bloem Sealants b.v., 2495 AA Den Haag, (Netherlands)

Determination of thermal conductivity

Project-Nr.	16-003531-PR04	**File No.**	16-003531
Client	EN 12667:2001-01		
Basis of the testings	Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance.		
Test specimen	Thermal conductivity Lambda - Measurement hot plate apparatus - variant 1		
Test specimen No.	33157-001, 33157-002		
Testing personnel in charge	Konrad Huber		
Test engineer	Konrad Huber		

Information about the testind procedure

Test methos There are no deviations to the test method according standard/basis

Test method and results

Pos.	Designation	Thermal resistance in (m²·K)/W	Thickness in mm	Thermal conductivity in W/(m·K)
Sum	Total configuation	1,423	49,4	0,035
Deduction	Sub total deduction	0,000	0,0	---
Result		1,423	49,4	**0,035**

Test report Nr. 12-001850-PR08 (PB-K04-06-en-01) dated 2.11.2016
Client: Rathor AG, 9050 Appenzell (Switzerland)

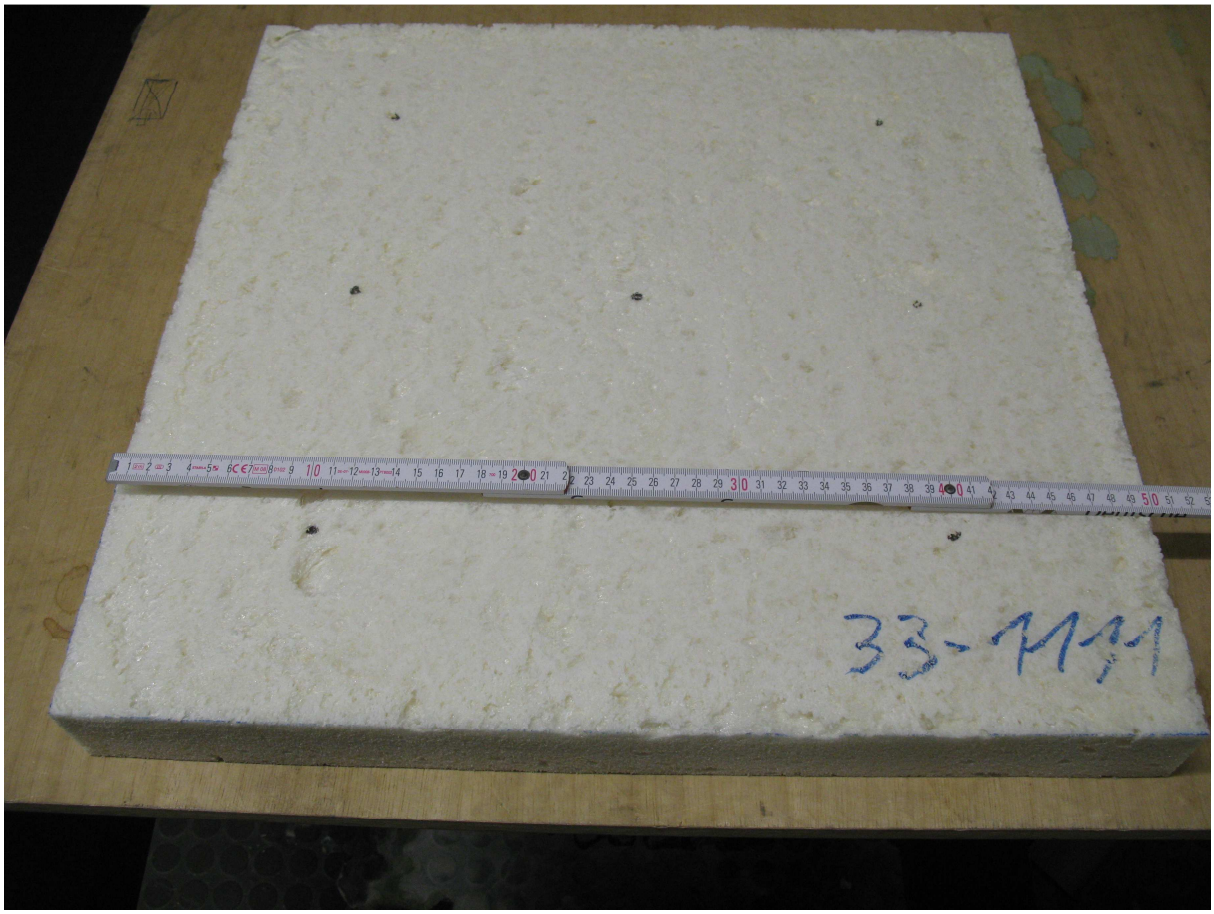


Photo 1 Test specimen