Test Report

Airtightness test of the "OBEX CORTEX 0521FR" system including connections

Manufacturer: OBEX Protection Limited

Airtightness system: Surface sealing

Darmstadt 16.05.2024

Passivhaus Institut GmbH
Rheinstrasse 44/46
64291 Darmstadt, Germany
www.passivehouse.com

Commissioned by: OBEX Protection Limited,
Unit 12 Horn Hill Road,
Nunnery Park,
Worcester, WR4 0SX
United Kingdom

Product: OBEX CORTEX 0521FR

Airtightness system consisting of
1. OBEX CORTEX 0521FR self-adhesive membrane

Tested size: 1.1 metre wide roll

1. Introduction

Airtightness across the surface is a central prerequisite for an effective airtightness concept. Airtightness of the building envelope is an essential element for its overall functioning, particularly in energy efficient buildings. This investigation took place under the most realistic possible boundary conditions within the framework of certification as a Passive House component in order to ensure that the tested products function in the installed state. In particular, the connection of the membrane to the typical adjacent materials was tested in the context of certification. With respect to the product system, this test examined the bonding of the membranes with each other and bonding with concrete and hard engineered wood panels (OSB in the present case), as well as the adhesive materials used.

2. Criteria

The values specified for Passive House certification of surface sealing products can be taken from Table 1 below:

Table 1: Requirement classes for the certification of surface sealing products according to Passive House Institute specifications

Class	**Air permeability per unit area** @ 50 Pa [$m^3/(hm^2)$]
ph**A**	≤ 0.10
ph**B**	≤ 0.18
ph**C**	≤ 0.25

These apply for the overall performance of a product system specified by the client, consisting of several components.

In addition, comprehensible processing guidelines/instructions for use must be provided for installation of the product, on which the test setup will be based. These must be made available to all users.

Testing of moisture permeability and specific moisture values at different ambient humidity levels are not part of this test.

3. Material to be tested

The required lengths of membranes were supplied by the client. The self-adhesive membrane is joined to adjacent pieces of membrane as well as to other members of the airtight layer by overlapping.

The following products were supplied by the client on 18.03.2024:

- OBEX CORTEX 0521FR (roll: width 1.1 m, length 30 m)
- Instructions for use

4. Setup for the membrane and connections

The membrane roll was cut into two metre pieces which were installed on a non-airtight glass fibre substrate and clamped into the test apparatus. For sealing, a frame which was identical in construction to the sub-frame of the test apparatus was placed on the apparatus. The frame and counter frames were each equipped with a 5 cm wide sealing surface which served as a support for the airtight membrane. The counter frame was tightened to a defined torque using screws and a torque wrench. Tension-free and uniform installation in the test stand was possible due to the even pressure of the counter frame.

For the connection to OSB or concrete, an OSB panel or a concrete slab was placed in the fixture provided for this purpose. The membrane was connected to the inset by overlapping, using the adhesive backing.

Each test setup (membrane to membrane, membrane to OSB and membrane to concrete) was created and measured three times in order to reflect any influences from workmanship.

4.1 Membrane to membrane

The connection of two pieces of membranes was carried out using an overlap in accordance with the manufacturer's instructions.

4.2 Membrane to concrete

An overlap of the self-adhesive membrane was used to connect to the concrete inset. For geometric restrictions on the test rig, the overlap had to be reduced to 7.5 cm.

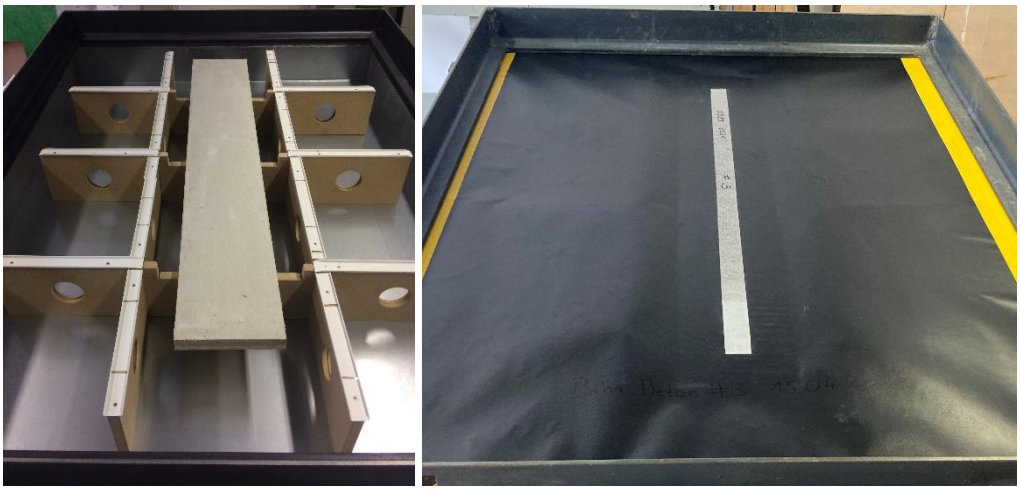

Fig. 1: **Fixture for panels in the test apparatus with the concrete slab in position (left). The fixture for the panels simultaneously serves to support the membrane at negative pressure. Concrete panel joined to the membrane on all four sides by overlap (right).**

4.3 Membrane to OSB panel

An overlap of the self-adhesive membrane was used to connect to the OSB inset. For geometric restrictions on the test rig, the overlap had to be reduced to 7.5 cm.

Fig. 2: **OSB panel joined to the membrane on all four sides by overlap.**

5. Test procedure

After setting up in the test stand and attaching the membrane, a measurement was carried out in compliance with DIN EN 12114. For this measurement, the following pressure stages were set for positive and negative pressure: 50, 100, 150, 200, 250, 300, 350 Pa. First the residual leakage of the test stand for all pressure stages was measured and documented for each measurement (reference measurement). For this, the test apparatus was closed using an airtight board. The infiltration air of the test stand determined thus was deducted from the result of the measurement afterwards.

In each measurement, the conveyed volume flow was measured and recorded for each individual pressure difference. With these pairs of measured values, it was possible to calculate the leakage coefficient ***C*** according to DIN 12114 Appendix B.

From the two series of reference measurements and the two series of actual measurements, linear equalising functions were determined through a regression analysis. After deducting the leakage of the test stand itself (reference measurement), the leakage flow was determined for the reference pressure difference of 50 Pa as an average value of the results from the series of negative and positive pressure measurements. This value is divided by the sample area in order to obtain the specific leakage flow per square metre. The free area of the sample is 1.72 m² or 1.48 m² with deduction of the cut-out for the OSB panel or concrete slab.

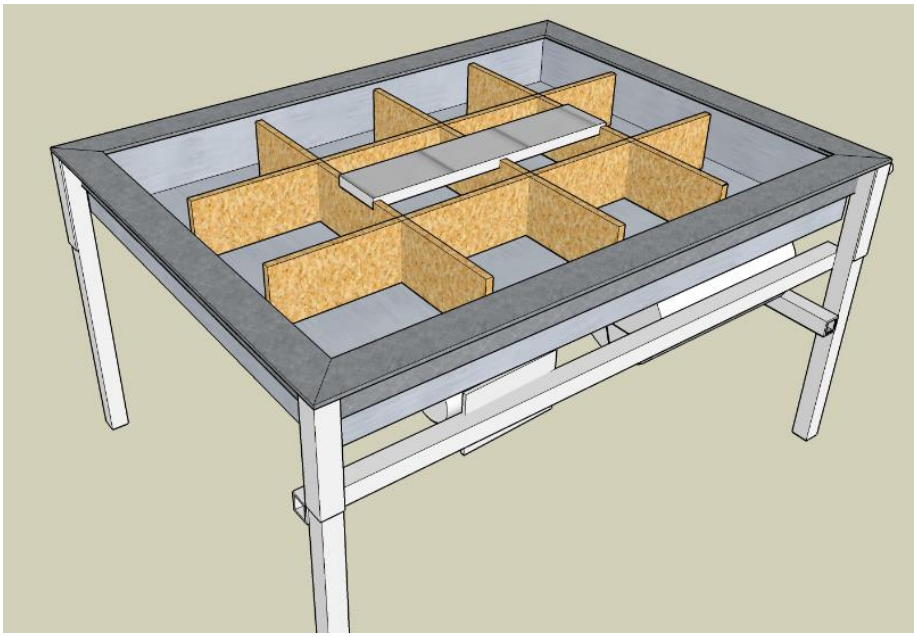

Fig. 3: **Sketch of the test apparatus with a fixture for the respective panels**

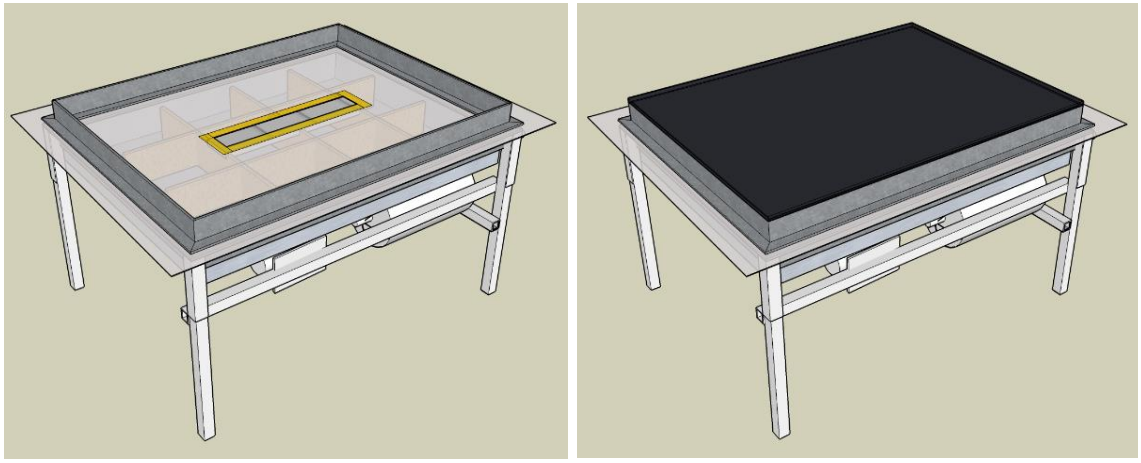

Fig. 4: **Sketch of the test apparatus with the clamped membrane and inserted panel (left) which is joined to the membrane with adhesive tape (yellow).**
Test apparatus sealed with the cover panel for determining the test stand leakage (right).

Fig. 5: **Test apparatus with clamped membrane (membrane to membrane joint by overlap)**

The measurements of the examined airtightness system took place in the time period 02.04.2024 to 29.04.2024.

6. Test results

The test results are shown in the following tables and figures, sorted according to the connection methods. The requirement classes for the certification of surface sealing systems are additionally entered in the diagrams.

6.1 Test with membrane

Connection to	
Membrane on its own	x
Membrane to membrane	
Membrane to OSB	
Membrane to concrete	

Table 2: Test results of the three measurements with the membrane without any connection

examined area	1,62 m²

Pressure stages	**Pa**	**50**	**100**	**150**	**200**	**250**	**300**	**350**
OBEX UK Cortex 0521FR #1								
total volume flow	m³/h	0,05	0,18	0,20	0,22	0,23	0,25	0,26
test stand leakage	m³/h	0,05	0,18	0,20	0,22	0,23	0,24	0,25
specific air volume flow	m³/h	0,00	0,00	0,00	0,00	0,00	0,00	0,00
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
OBEX UK Cortex 0521FR #2								
total volume flow	m³/h	0,06	0,20	0,23	0,25	0,27	0,29	0,30
test stand leakage	m³/h	0,05	0,19	0,21	0,23	0,25	0,26	0,27
specific air volume flow	m³/h	0,01	0,01	0,02	0,02	0,03	0,03	0,04
leakage volume flow based on area	m³/(h m²)	0,00	0,01	0,01	0,01	0,02	0,02	0,02
OBEX UK Cortex 0521FR #3								
total volume flow	m³/h	0,06	0,21	0,25	0,27	0,30	0,32	0,33
test stand leakage	m³/h	0,05	0,18	0,20	0,22	0,24	0,25	0,27
specific air volume flow	m³/h	0,02	0,04	0,05	0,06	0,06	0,07	0,08
leakage volume flow based on area	m³/(h m²)	0,01	0,02	0,03	0,03	0,04	0,05	0,05

Average

Q50 (PHI - assessment) **0,01** m³/(h m²)

resulting in an airtightness class of **A** according to PHI Q50 ≤ 0,1

In the following three diagrams with double logarithmic representation of the axis, the ascertained measured values are not recognisable because these are smaller than the smallest depicted y-axis value.

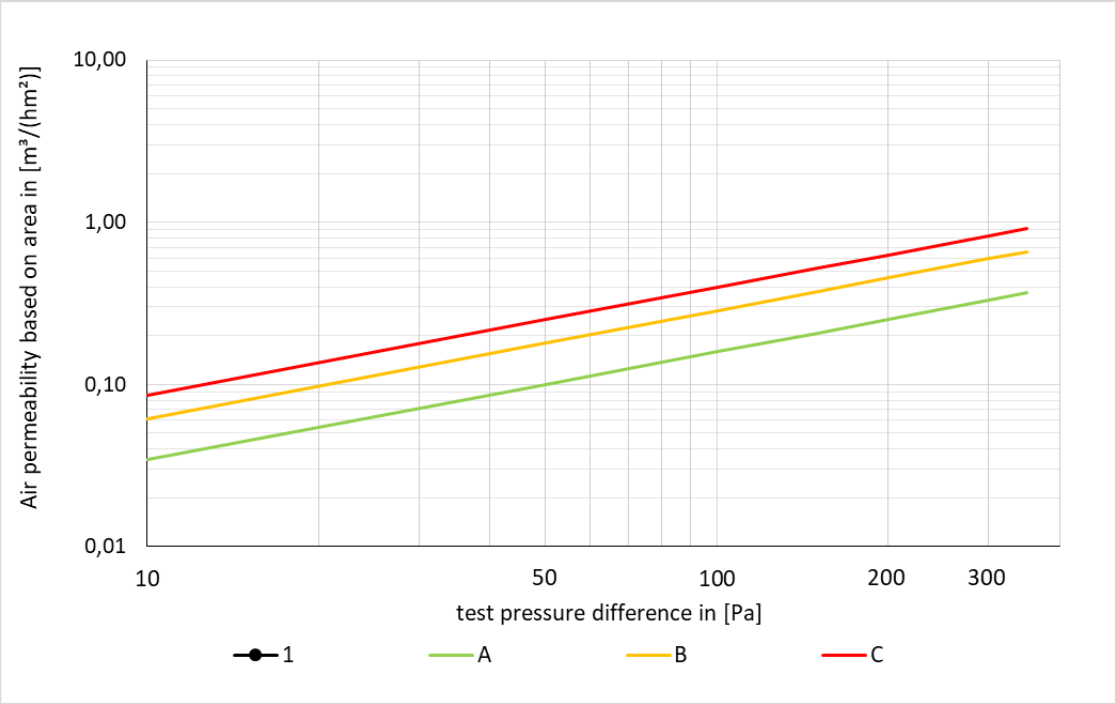

Fig. 6: **Series of measurements for the sample "OBEX CORTEX 0521FR" (membrane on its own). The certificate classes A to C according to the PHI are entered in addition.**

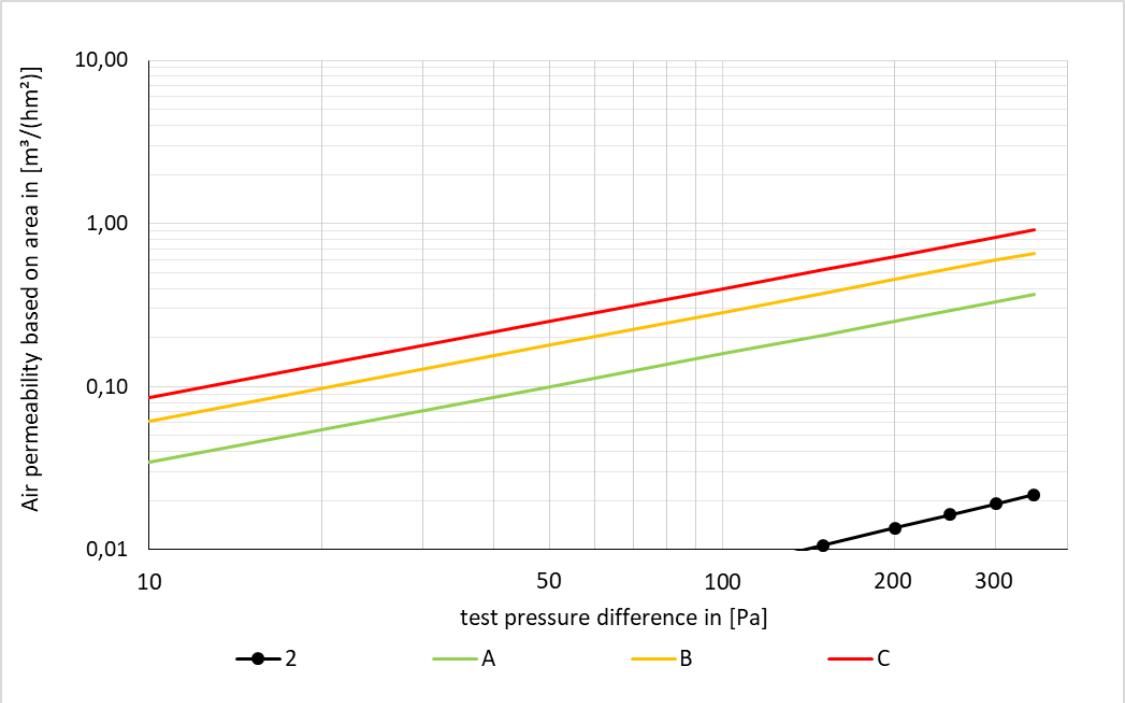

Fig. 7: **Series of measurements for the sample "OBEX CORTEX 0521FR" (membrane on its own). The certificate classes A to C according to the PHI are entered in addition.**

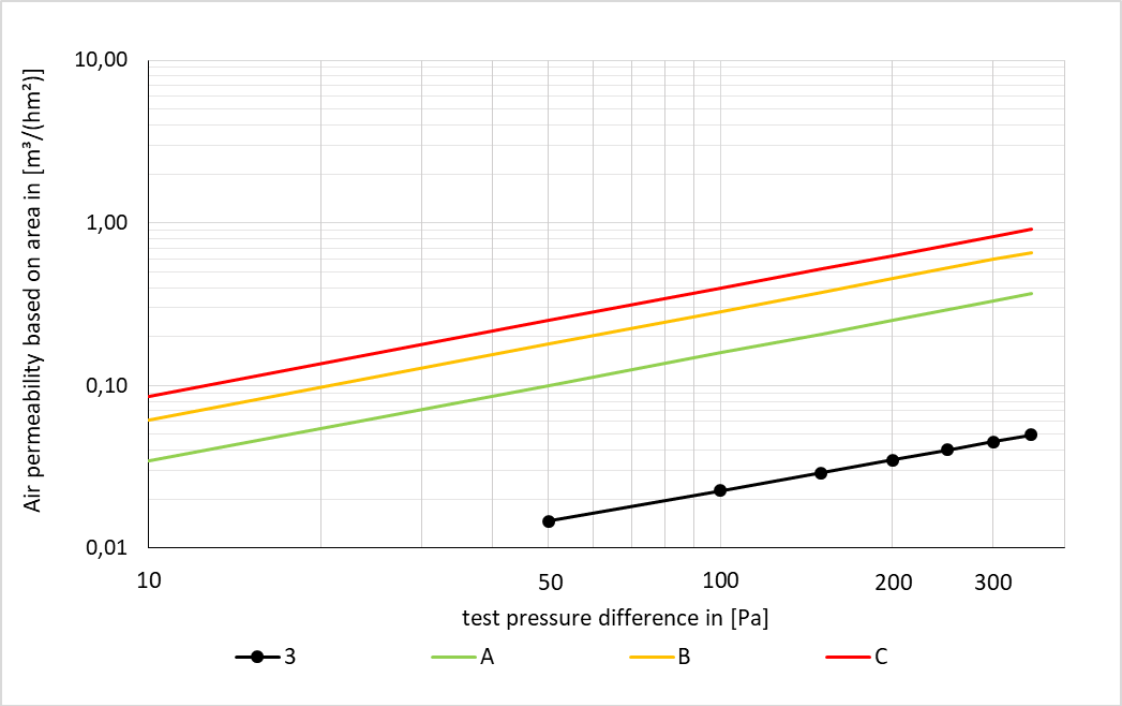

Fig. 8: **Series of measurements for the sample "OBEX CORTEX 0521FR" (membrane on its own). The certificate classes A to C according to the PHI are entered in addition.**

6.2 Membrane to membrane

Connection to	
Membrane on its own	
Membrane to membrane	x
Membrane to OSB	
Membrane to concrete	

Table 3: Test results of the three measurements with the membrane joined to the membrane using the self-adhesive coating

examined area	1,62 m²

Pressure stages	**Pa**	**50**	**100**	**150**	**200**	**250**	**300**	**350**
OBEX UK Cortex 0521FR to OBEX UK Cortex 0521FR #1								
total volume flow	m³/h	0,05	0,19	0,22	0,24	0,26	0,27	0,29
test stand leakage	m³/h	0,05	0,18	0,21	0,23	0,24	0,26	0,27
specific air volume flow	m³/h	0,00	0,01	0,01	0,01	0,01	0,01	0,02
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,00	0,01	0,01	0,01	0,01
OBEX UK Cortex 0521FR to OBEX UK Cortex 0521FR #2								
total volume flow	m³/h	0,05	0,19	0,21	0,24	0,26	0,27	0,29
test stand leakage	m³/h	0,05	0,18	0,20	0,22	0,24	0,25	0,26
specific air volume flow	m³/h	0,00	0,01	0,01	0,02	0,02	0,03	0,03
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,01	0,01	0,01	0,02	0,02
OBEX UK Cortex 0521FR to OBEX UK Cortex 0521FR #3								
total volume flow	m³/h	0,06	0,20	0,23	0,25	0,27	0,29	0,31
test stand leakage	m³/h	0,05	0,18	0,20	0,22	0,24	0,25	0,26
specific air volume flow	m³/h	0,01	0,02	0,02	0,03	0,03	0,04	0,04
leakage volume flow based on area	m³/(h m²)	0,01	0,01	0,01	0,02	0,02	0,02	0,03

Average

Q50 (PHI - assessment) **0,00** m³/(h m²)

resulting in an airtightness class of **A** according to PHI Q50 ≤ 0,1

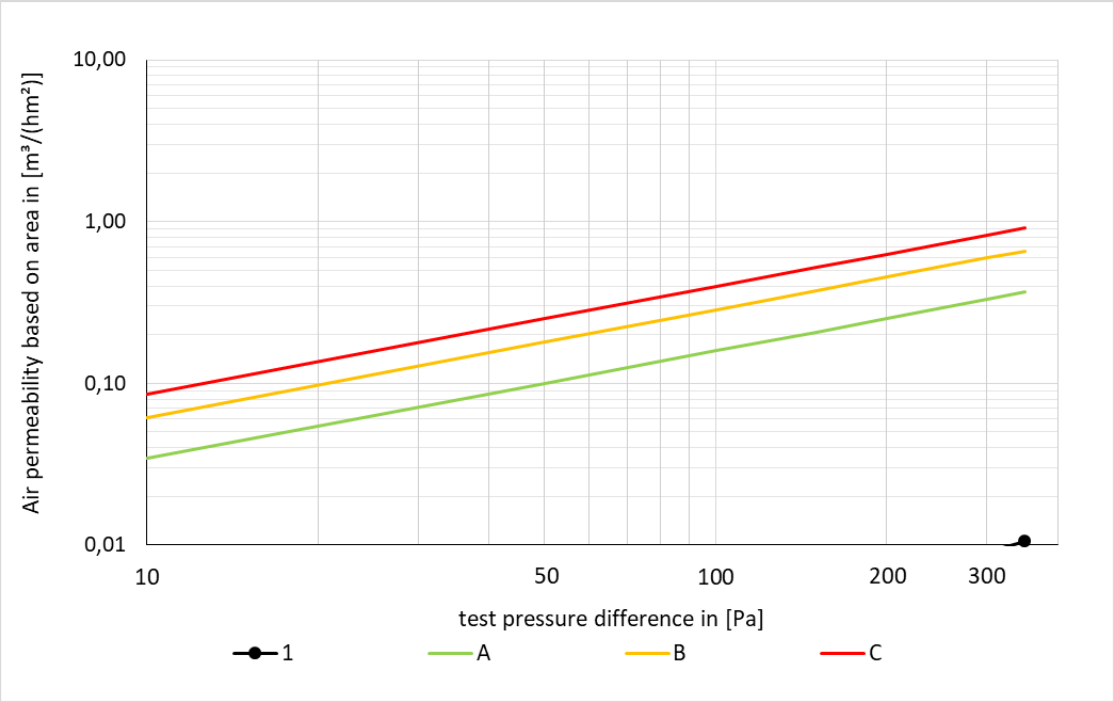

Fig. 9: **Series of measurements for the sample "OBEX CORTEX 0521FR to OBEX CORTEX 0521FR" #1. The certificate classes A to C according to the PHI are entered in addition**

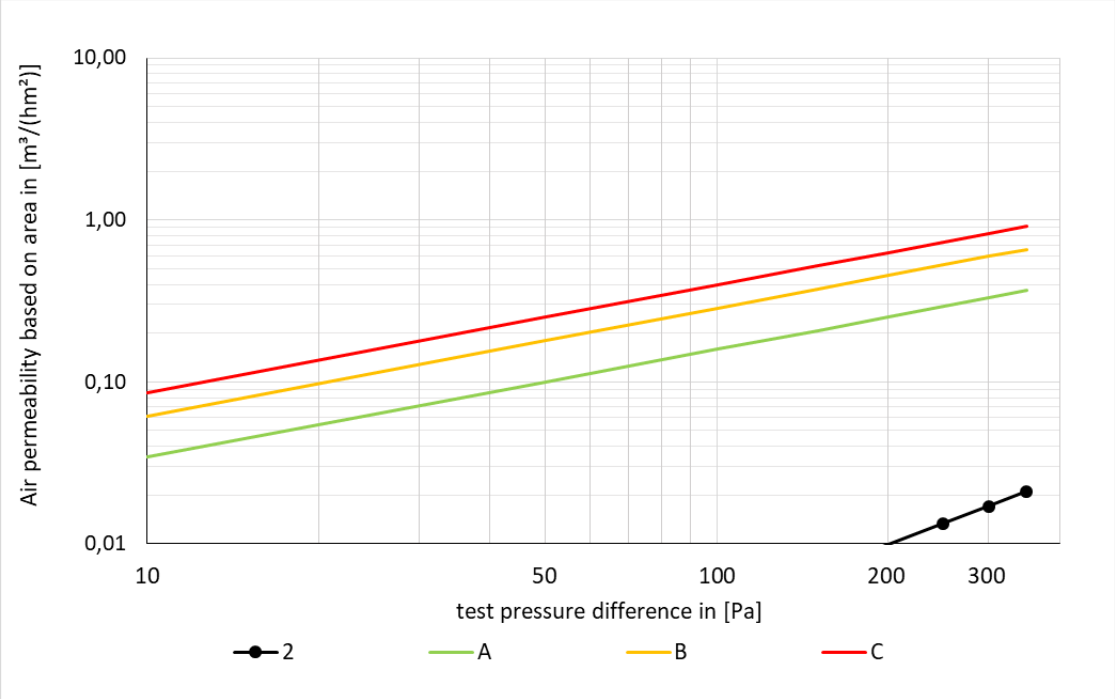

Fig. 10: **Series of measurements for the sample "OBEX CORTEX 0521FR to OBEX CORTEX 0521FR" #2. The certificate classes A to C according to the PHI are entered in addition.**

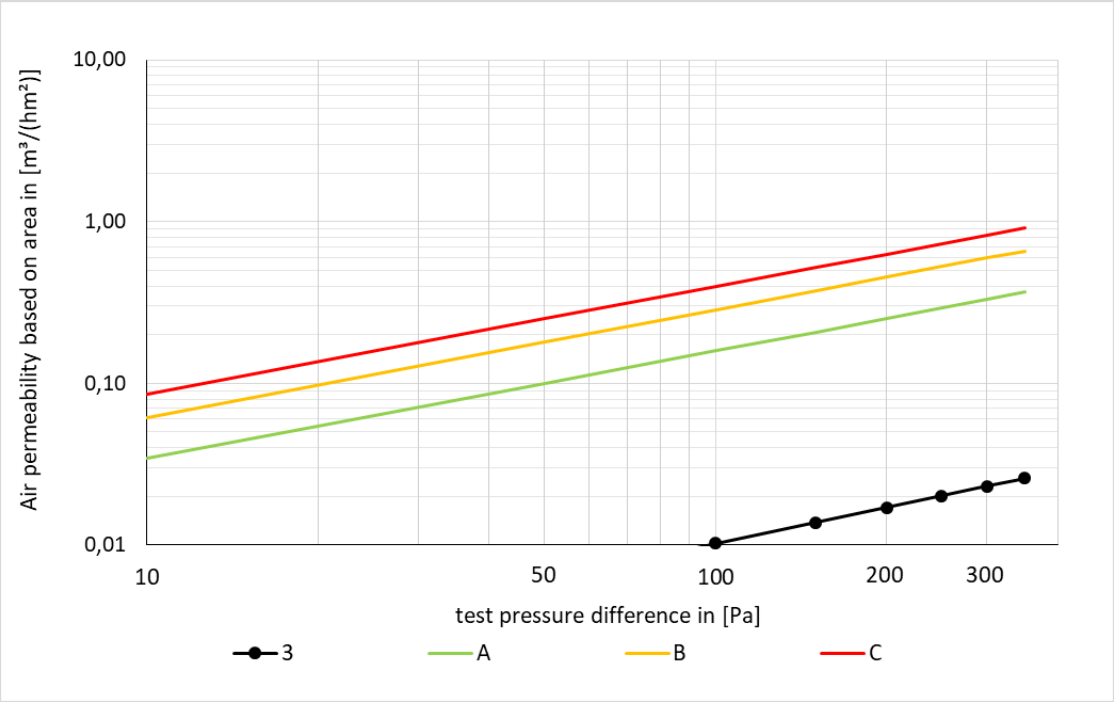

Fig. 11: **Series of measurements for the sample "OBEX CORTEX 0521FR to OBEX CORTEX 0521FR" #3. The certificate classes A to C according to the PHI are entered in addition.**

6.3 Membrane to OSB panel

Connection to	
Membrane on its own	
Membrane to membrane	
Membrane to OSB	x
Membrane to concrete	

Table 4: Test results of the three measurements with the membrane joined to the OSB panel using the self-adhesive coating

examined area	1,38 m²

Pressure stages	**Pa**	**50**	**100**	**150**	**200**	**250**	**300**	**350**
OBEX UK Cortex 0521FR to OSB #1								
total volume flow	m³/h	0,08	0,23	0,26	0,29	0,31	0,33	0,35
test stand leakage	m³/h	0,07	0,20	0,23	0,25	0,26	0,27	0,28
specific air volume flow	m³/h	0,01	0,02	0,03	0,04	0,05	0,06	0,07
leakage volume flow based on area	m³/(h m²)	0,01	0,01	0,02	0,03	0,04	0,04	0,05
OBEX UK Cortex 0521FR to OSB #2								
total volume flow	m³/h	0,09	0,27	0,34	0,39	0,44	0,49	0,53
test stand leakage	m³/h	0,05	0,20	0,23	0,25	0,27	0,29	0,31
specific air volume flow	m³/h	0,04	0,07	0,11	0,14	0,17	0,21	0,24
leakage volume flow based on area	m³/(h m²)	0,03	0,05	0,08	0,10	0,13	0,15	0,17
OBEX UK Cortex 0521FR to OSB #3								
total volume flow	m³/h	0,05	0,20	0,24	0,26	0,29	0,31	0,33
test stand leakage	m³/h	0,06	0,20	0,23	0,26	0,28	0,30	0,31
specific air volume flow	m³/h	0,00	0,01	0,01	0,01	0,02	0,04	0,09
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,01	0,01	0,01	0,03	0,06

Average

Q50 (PHI - assessment) **0,01** m³/(h m²)

resulting in an airtightness class of **A** according to PHI Q50 ≤ 0,1

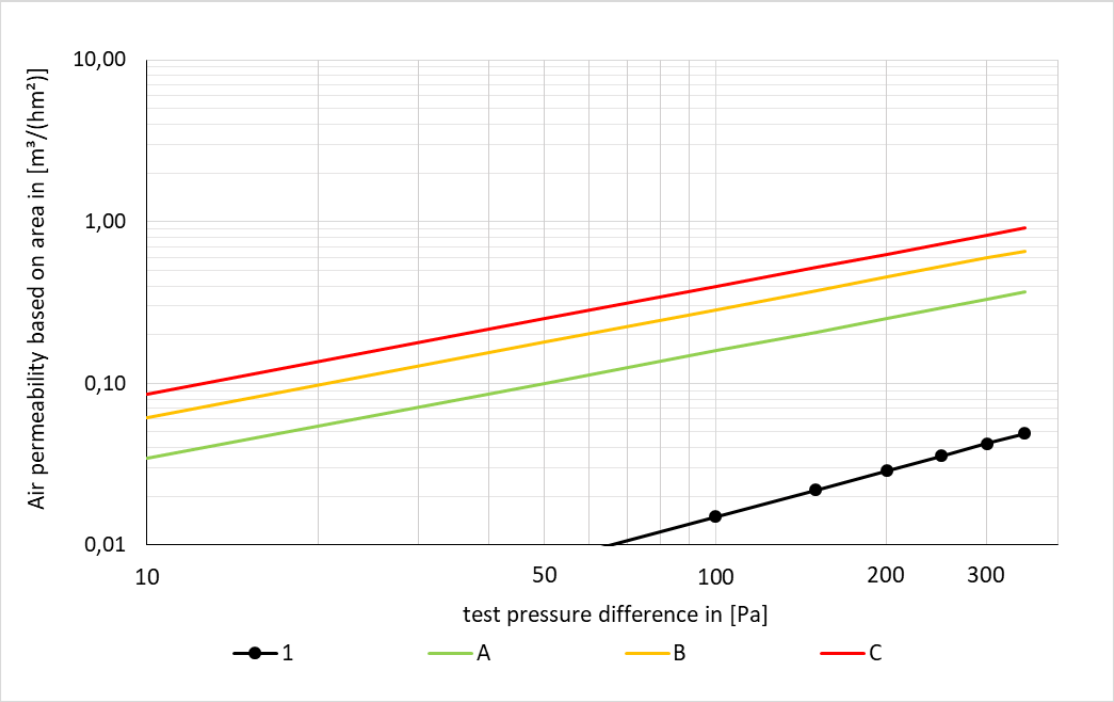

Fig. 12: **Series of measurements for the sample "OBEX CORTEX 0521FR to OSB panel #1". The certificate classes A to C according to the PHI are entered in addition.**

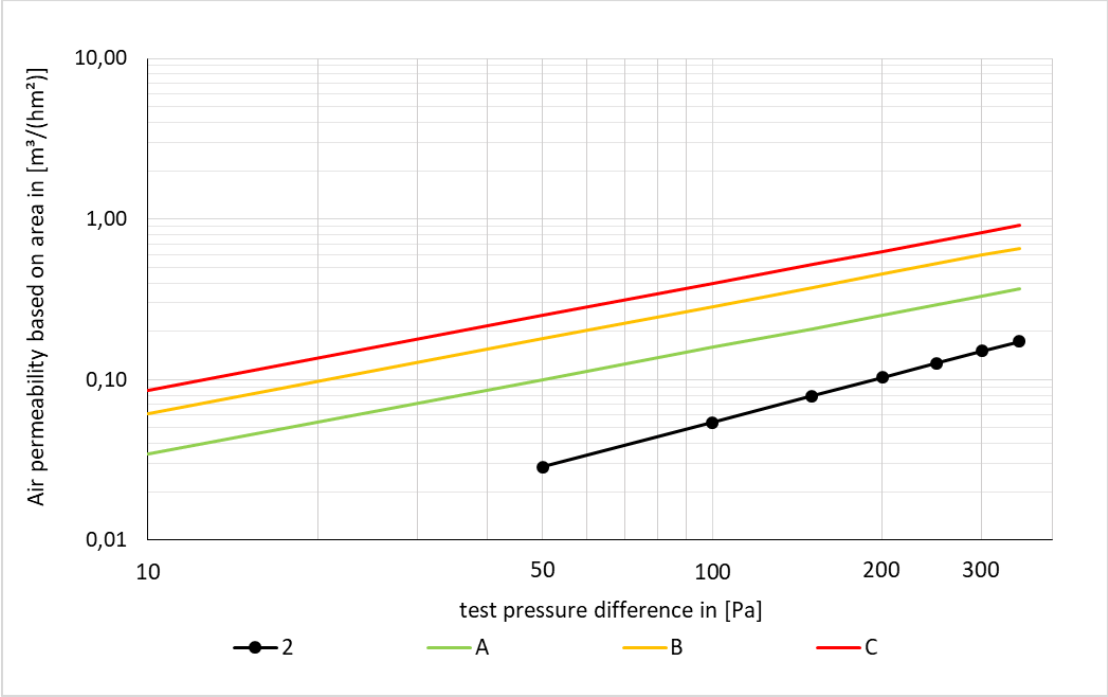

Fig. 13: **Series of measurements for the sample "OBEX CORTEX 0521FR to OSB panel #2". The certificate classes A to C according to the PHI are entered in addition.**

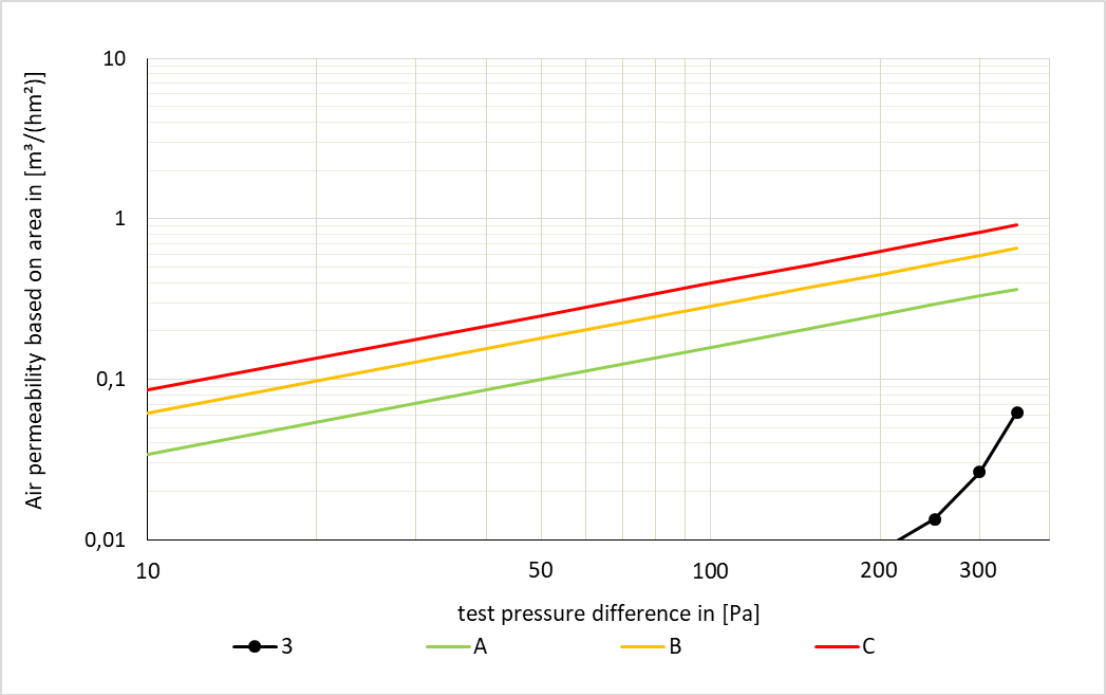

Fig. 14: **Series of measurements for the sample "OBEX CORTEX 0521FR to OSB panel #3". The certificate classes A to C according to the PHI are entered in addition.**

6.4 Membrane to concrete slab

Connected to	
Membrane on its own	
Membrane to Membrane	
Membrane to OSB	
Membrane to concrete	x

Table 5: Test results of the three measurements with the membrane joined to the concrete slab using the self-adhesive coating

examined area	1,38 m²

Pressure stages	**Pa**	**50**	**100**	**150**	**200**	**250**	**300**	**350**
OBEX UK Cortex 0521FR to concrete #1								
total volume flow	m³/h	0,04	0,18	0,20	0,22	0,24	0,25	0,27
test stand leakage	m³/h	0,06	0,20	0,23	0,25	0,27	0,28	0,30
specific air volume flow	m³/h	0,00	0,00	0,00	0,00	0,00	0,00	0,00
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
OBEX UK Cortex 0521FR to concrete #2								
total volume flow	m³/h	0,04	0,17	0,20	0,22	0,23	0,24	0,26
test stand leakage	m³/h	0,06	0,20	0,23	0,25	0,26	0,28	0,29
specific air volume flow	m³/h	0,00	0,00	0,00	0,00	0,00	0,00	0,00
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
OBEX UK Cortex 0521FR to concrete #3								
total volume flow	m³/h	0,04	0,18	0,20	0,22	0,23	0,25	0,26
test stand leakage	m³/h	0,06	0,20	0,22	0,25	0,26	0,28	0,29
specific air volume flow	m³/h	0,00	0,00	0,00	0,00	0,00	0,00	0,00
leakage volume flow based on area	m³/(h m²)	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Average

Q50 (PHI - assessment) **0,00** m³/(h m²)

resulting in an airtightness class of **A** according to PHI Q50 ≤ 0,1

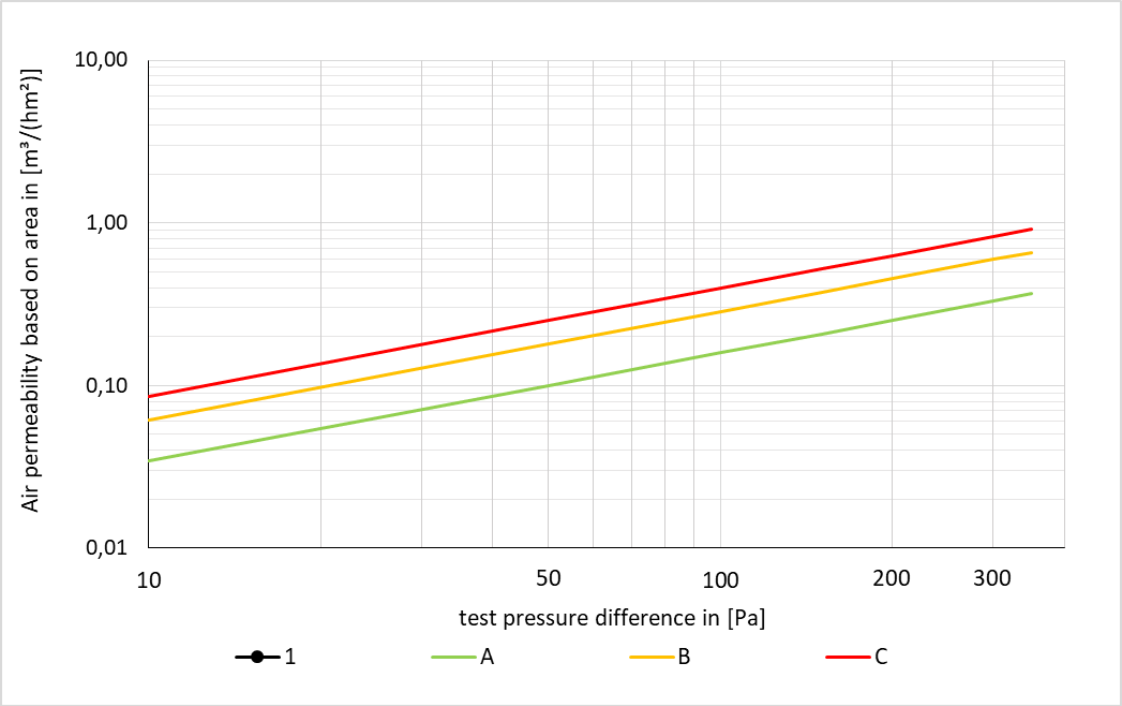

Fig. 15: **Series of measurements for the sample "OBEX CORTEX 0521FR to concrete slab #1". The certificate classes A to C according to the PHI are entered in addition.**

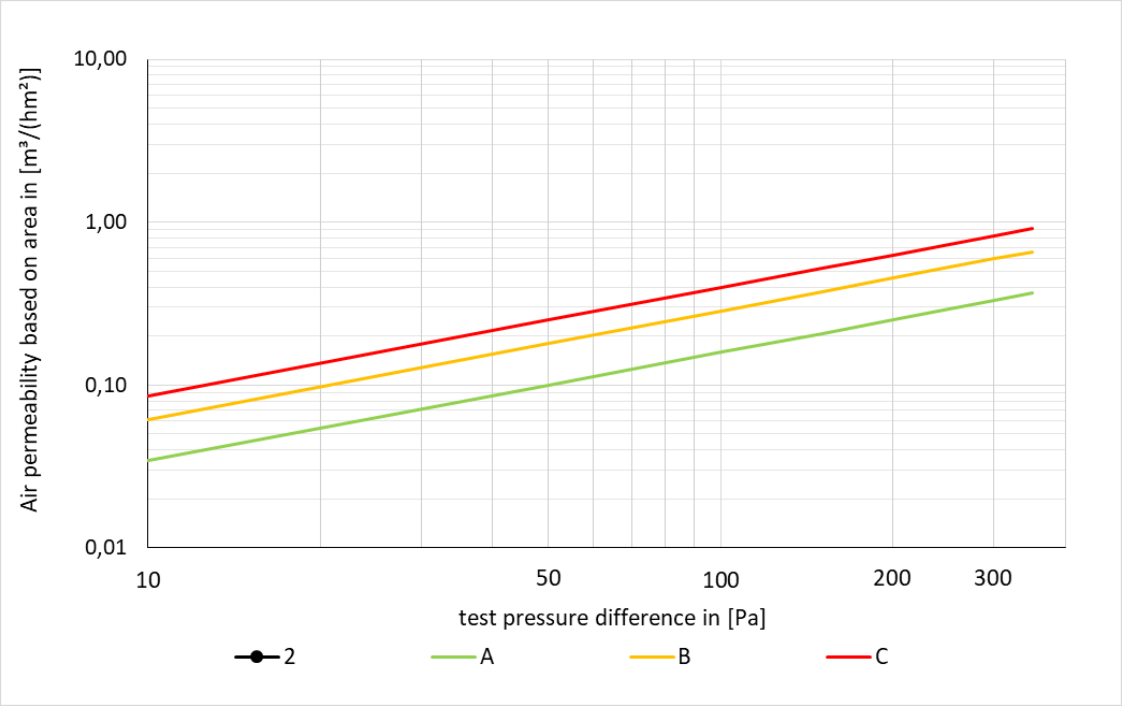

Fig. 16: **Series of measurements for the sample "OBEX CORTEX 0521FR to concrete slab #2". The certificate classes A to C according to the PHI are entered in addition.**

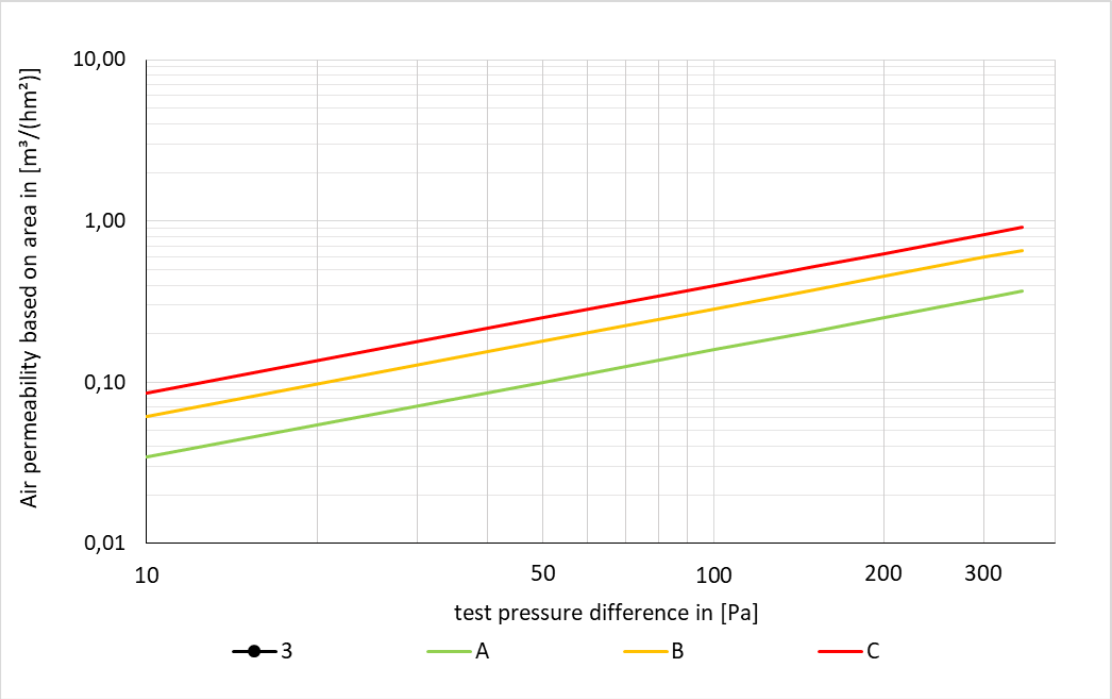

Fig. 17: **Series of measurements for the sample "OBEX CORTEX 0521FR to concrete slab #3". The certificate classes A to C according to the PHI are entered in addition.**

7. Test conditions

The indoor climate conditions during the measurements were as follows:

Indoor temperature: 19.1 – 22.4 °C
Indoor air humidity: 45 – 55 % r.H.

8. Measurement devices

A laminar flow element by the company TetraTec® Instruments was used for measuring the volume flow. The differential pressure was measured using an automated performance testing system (APT) by the manufacturer The Energy Conservatory.

Table 6: **Overview of the used measurement devices**

Name	Device type	Serial number	Measurement range	Measurement accuracy
LaminarMasterFlow-System	LMF	PH796	0-85 l/min	2% in the range of 8-80 l/min
TEC Automated Performance Testing	APT	0072 4	0-2000 Pa	1 %

9. Results

The results of these measurements were compiled and the overall average value was created according to the type of connection. In doing so, the measured value for the membrane on its own (without any joining) was not taken into account because this concerns certification as a system and not material testing only. On average, this resulted in an air permeability value of **0.01 (±0.004) m³/(hm²)** standardised for a test pressure of 50 Pa. The certification class "A" was achieved.

Table 7: Overview of the results of the airtightness measurement.

Average value of	**m³/(hm²) @ 50 Pa**
Membrane to membrane	0.00
Membrane to OSB	0.01
Membrane to concrete	0.00
Overall	**0.01 (±0.004)**

Table 8: Requirement class achieved by the examined product for certification as an "Airtightness system window connection" according to the specifications of the Passive House Institute

Class	**Air permeability per unit area** @ 50 Pa [m³/(hm²)]	**Class achieved**
ph**A**	**≤ 0.10**	✓
ph**B**	≤ 0.18	
ph**C**	≤ 0.25	

Darmstadt, 16.05.2024

Wolfgang Hasper