

# Evidence of Performance

Testing the joint characteristics of a sealing between window and building structure in new condition and after a series of simulated time-lapse short-term loads

## Test Report

N° 18-002553-PR02

(PB 2-E03-020310-en-02)



<b>Client</b>	Hermann Otto GmbH Otto Chemie Krankenhausstr. 14 83413 Fridolfing Germany
<b>Product</b>	Sealing system between window and building structure
<b>Designation</b>	Sealing internal / external: OTTOSEAL® M 360 with backfill twine OTTOCORD PE-B2
<b>Installation situation / Boundary conditions</b>	Hollow block wall with blunt reveal Wall including reveal areas plastered with lime cement plaster Single leaf PVC window 1,230 mm x 1,480 mm, centred in the reveal Fastening and load transfer to the supporting structure on sides and at top via frame screws and bearing pads. Fixing distances on sides and at top $\leq 700$ mm. Adhesive surfaces on masonry pre-treated with OTTO Primer 1225. Test without joint filling Processing according to the specifications of the client
<b>Scope</b>	Internal airtight and external watertight joint between external wall and window / casement doors in PVC with equivalent details, as described above.
<b>Special features</b>	The external, lower connection was not subject of the test.

### Results

Air permeability up to  $\pm 1,000$  Pa in new condition

$$a < 0.1 \text{ m}^3/[\text{m h (daPa)}^{2/3}]$$

Watertightness up to 600 Pa in new condition

no water penetration

Air permeability up to  $\pm 1,000$  Pa after simulated short-term exposures (temperature, wind, use)

$$a < 0.1 \text{ m}^3/[\text{m h (daPa)}^{2/3}]$$

Watertightness up to 600 Pa after simulated short-term loads (temperature, wind, use)

no water penetration

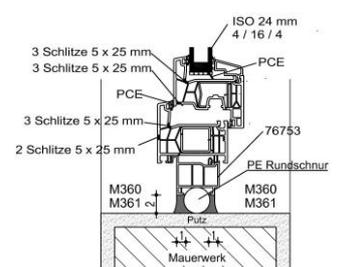
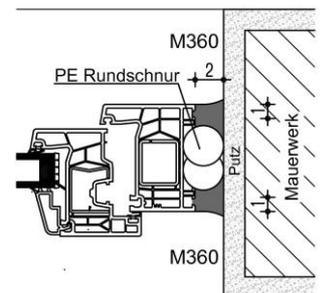


### Basis:

ift-Guideline MO-01/1 : 2007-01  
Wall connection of Windows  
Part 1: Method to determine the fitness for use of weatherproofing systems

Test Report 18-002553-PR02  
(PB 2-E03-020310-de-02) dated 05.07.2019

### Representation



### Instructions for use

This test report serves to demonstrate the above mentioned characteristics.

### Validity

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

### Notes on publication

The ift-Guidance Sheet "Advertising with ift test documents" applies. The cover sheet can be used as an abstract.

### Contents

The report contains a total of 23 pages.

ift Rosenheim

18.03.2020

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Building Component Testing

Testing the joint characteristics of a sealing between window and building structure in new condition and after a series of simulated time-lapse short-term loads

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 Client Hermann Otto GmbH  
 Otto Chemie, 83413 Fridolfing (Germany)



## 1 Object

### 1.1 Description of test specimen

The test specimen consists of a bricked steel frame, which has a wall opening for window installation. A single sashed tilt and turn window is installed in the wall opening. The test specimen consisted of two sealing variants, whereby this test report covers the left half (seen from the inside). The external, lower connection was not subject of the test.

**Test specimen** Component frame for evaluation of a sealing system in new condition as well as after simulated short-term load

#### Wall structure

Masonry vertically perforated brick in a bond  
 Wall thickness 24  
 Reveal unrebated  
 External thermal insulation none  
 composite system  
 Clear masonry opening in mm 1,270 mm x 1,510 mm  
 Skim coating HASIT 650 lime cement plaster

#### Window

Type of window Single tilt and turn window  
 Material uPVC - white  
 Overall frame dimensions in mm 1,230 x 1,480 (including 30 mm window sill connecting profile)  
 Reinforcement Steel reinforcement in frame and casement member  
 Glass configuration 4 / 16 / 4  
 Installation position in the wall centred  
 Joint width continuous approx. 20 mm  
 Additional sealing measures at window Interface gap in the corners horizontally at bottom and on sides approx. 10 cm - 15 cm high, sprayed with sprayable sealant before mounting of frame

#### Fixing of window

Product designation / type / item n° dowel-less frame screws  
 Material galvanized steel  
 Number of fixations on sides each 3, at top centred 1  
 Fixing distance on sides and at top  $\leq$  700 mm  
 Blocking / load transfer load transfer of self-weight via support pads at bottom; frame screws take up laterally the position of bearing pads and spacer pads

#### External / Internal sealing

Manufacturer / Date of manufacture sealing of the joint was done by the client  
 Product designation / type / item n° OTTOSEAL® M 360  
 Manufacturer Hermann Otto GmbH  
 Material 1-component adhesive and sealant based on hybrid polymer STP  
 Dimensions in mm For dimensions of the respective seal see picture documentation

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Preparation of bonding surfaces	Frame cleaned before installation, masonry pre-treated with OTTO Primer 1225 before installation
Mounting method	with OTTOCORD PE-B2 backfill twine; backfill twine interrupted in area of bearing pads
Corner configuration	4-sided circumferential sealing, backfill twine butt-jointed in corners
Remark	The external, lower connection was not part of the test.
<b>Joint filling</b>	No joint filling provided.

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

The samples (joint filling materials) were selected by the client.

Delivered on: 03.09.2018

ift-No. of test specimen (PK): 18-002553-PK02 / WE: 46743-002

Design: The window installation (fixation) as well as the connecting joint formation were carried out by the client according to the respective processing guidelines / assembly instructions.

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Otto Chemie, 83413 Fridolfing (Germany)



## 2 Procedure

### 2.1 Basis \*) referring to method/s

#### Test

ift-Guideline MO-01/1 : 2007-01 Wall connection of Windows  
Part 1: Determination of fitness for use of sealing systems  
Clause 5, Test of joint characteristics

EN 12114:2000-04

Air permeability of building components and building elements – Laboratory test method

EN 1027:2000-06

Windows and doors - Watertightness - Test method

EN 12211:2000-06

Windows and doors - Resistance to wind load - Test method

EN 1191:2012-12

Windows and doors - Resistance to repeated opening and closing - Test method

#### Classification / Evaluation

ift-Guideline MO-01/1 : 2007-01 Wall connection of Windows  
Part 1: Determination of fitness for use of sealing systems  
Clause 5, Test of joint characteristics

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

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## 2.2 Sequence of testing

The test sequence was based on the ift-Guideline MO-01/1, Clause 5.3.

**Table 1** Test sequence

N°	Procedure	Test method
<b>Initial test</b>		
1	Visual control of test specimen	- / -
2	Watertightness test of connecting joint	based on EN 1027
3	Test of air permeability of connecting joint	EN 12114
<b>Loading test</b>		
4	Loading by changing temperatures in the outside (+60 °C / -15 °C, 10 cycles)	ift method
5	Mechanical durability (turn - tilt – close, 10,000 cycles)	based on EN 1191
6	Exposure to alternating positive/negative pressure ( $\pm 1,000$ Pa, 200 cycles)	based on EN 12211
<b>Final test/evaluation</b>		
7	Test of air permeability of connecting joint	EN 12114
8	Watertightness test of connecting joint	based on EN 1027
9	Dismounting and visual inspection of test specimen	- / -

Testing the joint characteristics of a sealing between window and building structure in new condition and after a series of simulated time-lapse short-term loads

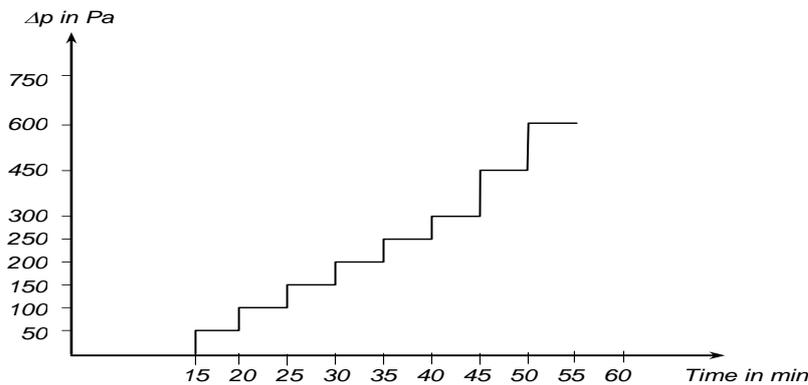
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## 2.3 Brief description of procedure

### Watertightness in accordance with EN 1027

Watertightness is tested in accordance with EN 1027 up to the maximum test pressure difference. Using a row of nozzles located at the top, the external face of the test specimen is subjected to constant spraying of water at a flow rate of approx. 2 l/min per nozzle while increments of positive test pressure are applied at regular intervals. (Illustration 1)

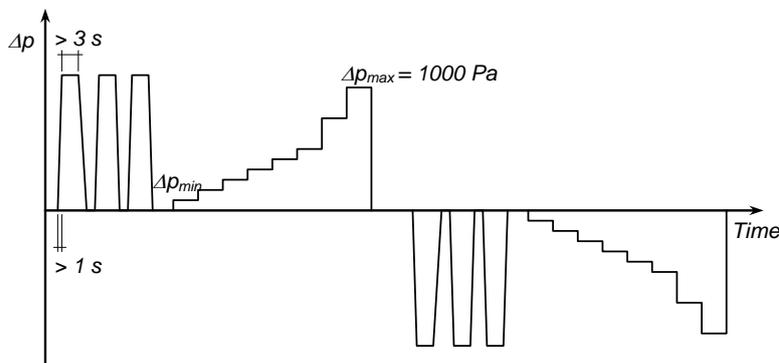


**Illustration 1** Test sequence of watertightness test

### Air permeability - EN 12114

The air permeability of the sealing system is tested as per DIN EN 12114 at positive and negative pressures, in steps up to a maximum test pressure difference of 1,000 Pa (Illustration 2).

The joints between casement and frame members and the joints along the glazing beads were sealed. Any air leakages in the wall system were taken into account by comparative measurements. It follows that only the air flow through the connecting joint was measured, regardless of any air leakages of the window and the external wall system.



**Illustration 2** Air permeability test - exposure at positive and negative pressures

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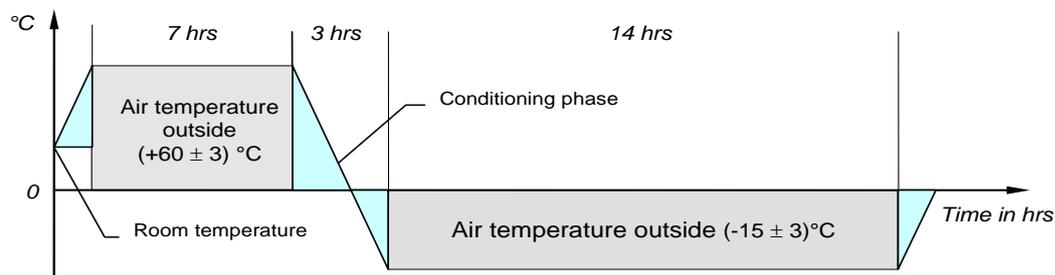
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### Loading by changing temperatures

The test specimen is pressurized on the outside with the loading by changing temperatures for 10 cycles, as displayed schematically in Illustration 3. During this exposure, the internal face of the test specimen is exposed to room climate.

During and after the exposures, the joining system was checked by visual inspection for any changes. The displacements of the frame member relative to the building fabric perpendicular to the window plane were recorded continually by the linear potentiometers.



**Illustration 3** Representation of one thermal cycle of exposure to alternating temperatures

### Simulated use, mechanical durability

Simulated operation via 10,000 hardware operations based on DIN EN 1191. The casement is brought 10,000 times into the tilt position, closed, opened in turn position, closed.

During and after the exposures, the joint was checked by visual inspection for any detectable changes.

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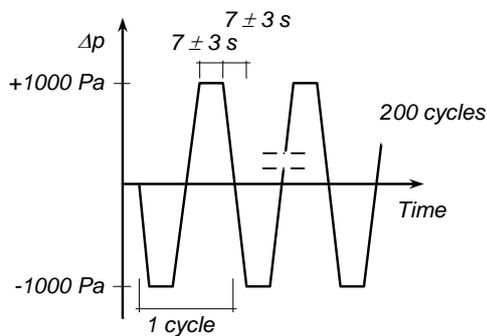
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### Wind load at pressure-suction-load

The wind load is applied to the test specimen as pressure-suction-load following DIN EN 12211 with 200 cycles of  $\pm 1,000$  Pa, as displayed schematically in Illustration 4.

During and after the exposures, the joining system was checked by visual inspection for any changes. The displacements of the frame member relative to the building fabric perpendicular to the window plane were recorded continually by the linear potentiometers by comparing the 1<sup>st</sup> cycle to the 200<sup>th</sup> cycle.



**Illustration 4** Representation of alternating positive/negative pressure pulses

### Final visual inspection

After completion of tests, the joint areas were opened up and checked by visual inspection for any changes.

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### 3 Expression of results

#### Watertightness in new condition

Project-No. 18-002553-PR02  
 Basis EN 1027:2016-03  
 Windows and doors - Watertightness - Test method  
 Test equipment Pst/022999 - Window and facade test rig  
 Test specimen Wall connection with sprayable sealant  
 Test specimen No. 46743-002  
 Date of test 17.10.2018  
 Test engineer in charge Thomas Krichbaumer  
 Test engineer Thomas Krichbaumer

#### Implementation of tests Deviations

There have been the following deviations from the test method specified in the standard/basis:  
 The test is made based on EN 1026, as the scope is not applicable.

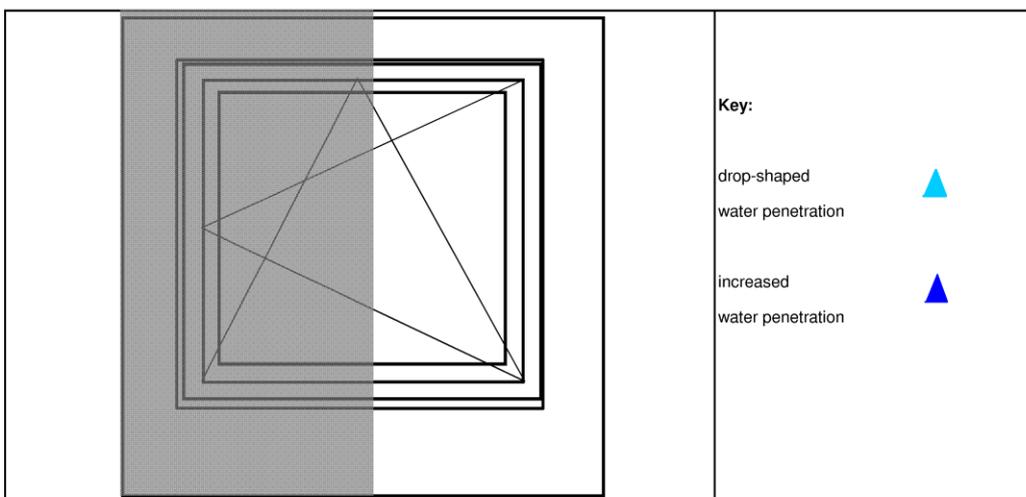
#### Ambient conditions

Temperature 19.0 °C Air humidity 45 % Air pressure 966 hPa  
 The ambient conditions are in accordance with the standard/basis requirements.

#### Measurement data/Results

Test state: The test was made without internal connection and joint filling.  
 Number of spray nozzles: 4  
 Amount of water: 480 l/h  
 0.48 m³/h

Three pressure pulses with 660 Pa were applied.



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**Table: Test**

Pressure/Pa	Observation
0	no water penetration
50	no water penetration
100	no water penetration
150	no water penetration
200	no water penetration
250	no water penetration
300	no water penetration
450	no water penetration
600	no water penetration

**Result:**

There was no water penetration determined until 600 Pa over the evaluated area.

**Comments**

The lower attachment was not part of the test.

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### Air permeability in new condition

Project-No. 18-002553-PR02  
 Basis EN 12114:2000-03  
 Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method  
 Test equipment Pst/020920 - Window and facade test rig  
 Test specimen Wall connection with sprayable sealant  
 Test specimen No. 46743-002  
 Date of test 05.11.2018  
 Test engineer in charge Thomas Krichbaumer  
 Test engineer Thomas Krichbaumer

#### Implementation of tests

Deviations There have been no deviations from the test method as specified in the standard/basis.

Ambient conditions Temperature 19.0 °C Air humidity 45 % Air pressure 958 hPa  
 The ambient conditions are in accordance with the standard/basis requirements.

### Measurement data/Results

Casement size 1230 mm x 1480 mm  
 Joint length 2,71 m  
 Test condition The external sealing was bridged for testing.  
 Initial load before positive / negative wind pressure 1100 Pa

#### Air permeability at positive wind pressure

**Table A:** Zero measurement, installation gaps bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	0,5	0,8	1,0	1,4	1,9	2,7	3,7	5,0	6,9

**Table B:** Air measurement, installation gaps not bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	0,5	0,8	1,1	1,5	2,0	2,7	3,7	5,2	7,2

**Table C:** Difference, Table B - Table A

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,2	0,3
Flow rate in m <sup>3</sup> /hm	0,00	0,00	0,00	0,01	0,01	0,02	0,03	0,07	0,11

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**Air permeability at negative wind pressure**

**Table A:** Zero measurement, installation gaps bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	0,5	0,8	1,0	1,4	2,0	2,6	3,6	4,9	6,6

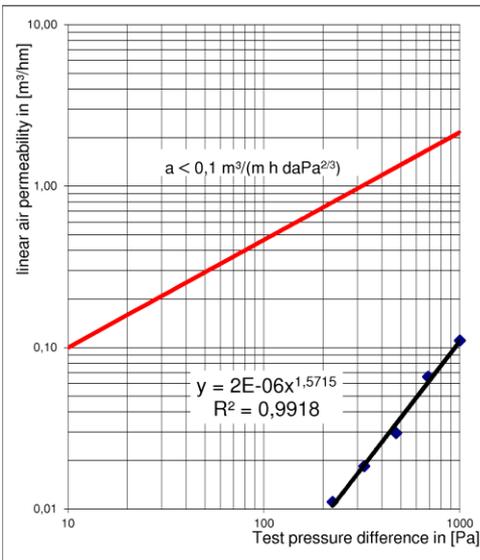
**Table B:** Air measurement, installation gaps not bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	0,5	0,8	1,0	1,4	2,0	2,6	3,6	4,9	6,6

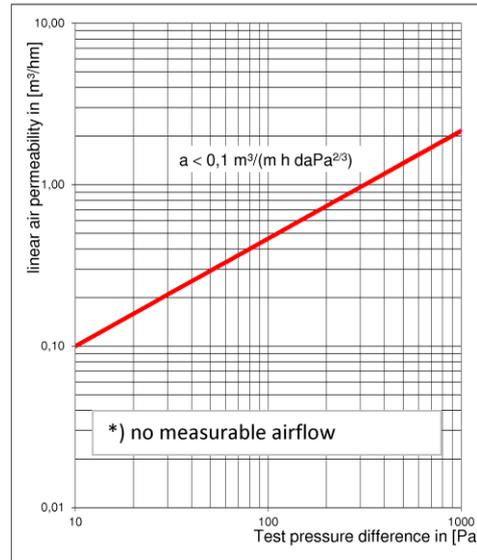
**Table C:** Difference of air permeability, Table B - Table A

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	*)	*)	*)	*)	*)	*)	*)	*)	*)
Flow rate, in m <sup>3</sup> /hm	*)	*)	*)	*)	*)	*)	*)	*)	*)

\*) no measurable airflow



Graphics at positive wind pressure



Graphics at negative wind pressure

**Result:** Q10= 0,00 m<sup>3</sup>/hm  
 Q100= 0,00 m<sup>3</sup>/hm

**Result:** Q10= \*) m<sup>3</sup>/hm  
 Q100= \*) m<sup>3</sup>/hm

**Comments**

The external sealing level was bridged for the test. The connecting joint was opened towards the test chamber through holes in the frame.

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Otto Chemie, 83413 Fridolfing (Germany)



### Mechanical durability

Project-No. 18-002553-PR02  
Basis EN 1191:2000-02  
Windows and doors - Resistance to repeated opening and closing - Test method  
Test equipment Pst/022203 - Hardware test device 2 white  
Test specimen Wall connection with sprayable sealant  
Test specimen No. 46743-002  
Date of test KW 45, 2018  
Test engineer in charge Thomas Krichbaumer  
Test engineer Darius Janikowski

#### Implementation of tests

Deviations  
There have been the following deviations from the test method specified in the standard/basis:  
The test was carried out based on EN 1191, as the scope and the required opening angle of rotation were not applicable.  
The ambient conditions are in accordance with the standard/basis requirements.

### Measurement data/Results

The test specimen was submitted to a durability test with 10,000 operation procedures.  
The sash was brought 10,000 times in tilt position, closed, opened in turn mode, closed.

#### Changes in the area of the installation gap

At the test specimen were no changes in the area of the installation gap visually detected.

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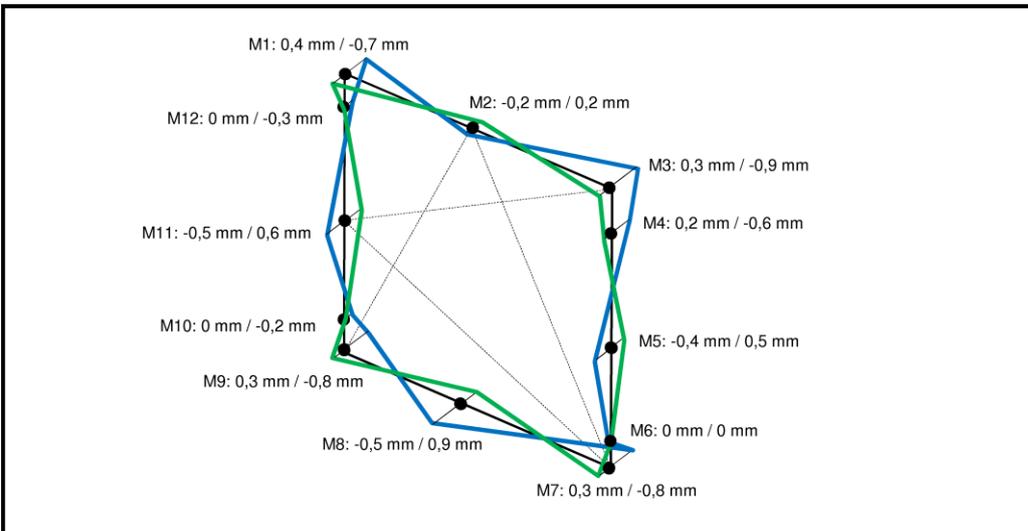


**Loading by changing temperatures**

Project-No. 18-002553-PR02  
 Basis ift-Guideline MO-01/1:2007-01  
 Wall connection of Windows - Part 1: Method to determine the fitness for use of weatherproofing systems  
 Test equipment Pst/020094 - Data logging  
 TM/023030 - Thermal cycling test rig mobile  
 Test specimen Wall connection with sprayable sealant  
 Test specimen No. 46743-002  
 Date of test CW 45, 2018 - CW 47, 2018  
 Test engineer in charge Thomas Krichbaumer  
 Test engineer Darius Janikowski

Implementation of tests  
 Deviations There have been no deviations from the test method as specified in the standard/basis.  
 The ambient conditions are in accordance with the standard/basis requirements.

**Measurement data/Results**



Temperature	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
+60°C	0,4	-0,2	0,3	0,2	-0,4	0	0,3	-0,5	0,3	0	-0,5	0				
-15°C	-0,7	0,2	-0,9	-0,6	0,5	0	-0,8	0,9	-0,8	-0,2	0,6	-0,3				

Residual deformation	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
	-0,3	0	-0,7	-0,3	0,6	0,2	-0,4	0,5	-0,4	0,1	0,5	-0,1				

All dimensions in mm

**Result:**

At the test specimen were no visually detectable changes detected.

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**Resistance to wind load - Dynamic wind load**

Project-No. 18-002553-PR02  
 Basis EN 12211:2016-03  
 Windows and doors - Resistance to wind load - Test method  
 Test equipment Pst/020094 - Data logging  
 Pst/020920 - Window and facade test rig  
 Test specimen Wall connection with sprayable sealant  
 Test specimen No. 46743-002  
 Date of test 22.11.2018  
 Test engineer in charge Martin Heßler  
 Test engineer Martin Heßler

**Implementation of tests**

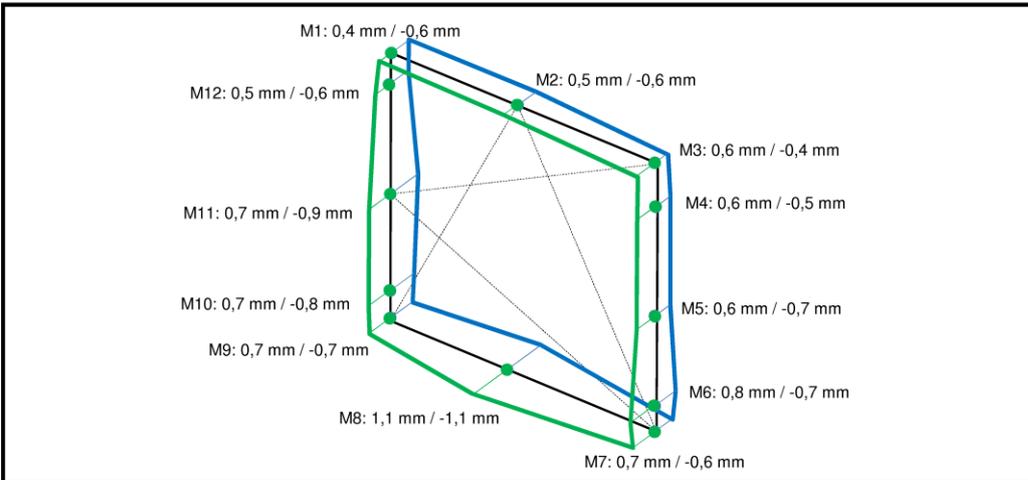
Deviations There have been the following deviations from the test method specified in the standard/basis:

The test was made based on EN 12211 as the scope is not applicable.

Ambient conditions Temperature 19.0 °C Air humidity 38 % Air pressure 960 hPa

The ambient conditions are in accordance with the standard/basis requirements.

**Measurement data/Results**



First cycle	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
	0,4	0,4	0,4	0,5	0,5	0,7	0,7	1,0	0,6	0,5	0,5	0,4				
	-0,6	-0,6	-0,5	-0,5	-0,6	-0,6	-0,6	-1,0	-0,6	-0,8	-0,8	-0,6				
Last cycle	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
	0,4	0,5	0,6	0,6	0,6	0,8	0,7	1,1	0,7	0,7	0,7	0,5				
	-0,6	-0,6	-0,4	-0,5	-0,7	-0,7	-0,6	-1,1	-0,7	-0,8	-0,9	-0,6				
Residual deformation	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
	-0,1	0,0	0,0	0,1	0,0	0,0	0,0	-0,1	0,0	0,0	0,0	0,0				

All dimensions in mm

**Result:**

At the test specimen were no visually detectable changes detected.

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### Air permeability after load

Project-No. 18-002553-PR02  
 Basis EN 12114:2000-03  
 Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method  
 Test equipment Pst/020920 - Window and facade test rig  
 Test specimen Wall connection with sprayable sealant  
 Test specimen No. 46743-002  
 Date of test 22.11.2018  
 Test engineer in charge Martin Heßler  
 Test engineer Martin Heßler

Implementation of tests  
 Deviations There have been no deviations from the test method as specified in the standard/basis.

Ambient conditions Temperature 18.7 °C Air humidity 38 % Air pressure 965 hPa  
 The ambient conditions are in accordance with the standard/basis requirements.

### Measurement data/Results

Casement size 1230 mm x 1480 mm  
 Joint length 2,71 m  
 Test condition The external sealing was bridged for testing.  
 Initial load before positive / negative wind pressure 1100 Pa

#### Air permeability at positive wind pressure

**Table A:** Zero measurement, installation gaps bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	1,4	1,8	2,4	3,2	4,5	5,8	7,6	10,0	13,4

**Table B:** Air measurement, installation gaps not bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	1,4	1,9	2,5	3,4	4,7	6,1	8,2	10,9	15,1

**Table C:** Difference, Table B - Table A

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m <sup>3</sup> /h	0,1	0,1	0,1	0,1	0,2	0,3	0,5	0,9	1,6
Flow rate in m <sup>3</sup> /hm	0,03	0,02	0,03	0,04	0,08	0,12	0,19	0,35	0,59

Testing the joint characteristics of a sealing between window and building structure in new condition and after a series of simulated time-lapse short-term loads



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 Client Hermann Otto GmbH  
 Otto Chemie, 83413 Fridolfing (Germany)

**Air permeability at negative wind pressure**

**Table A:** Zero measurement, installation gaps bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m³/h	1,3	1,7	2,3	3,0	4,0	5,3	7,0	9,0	11,5

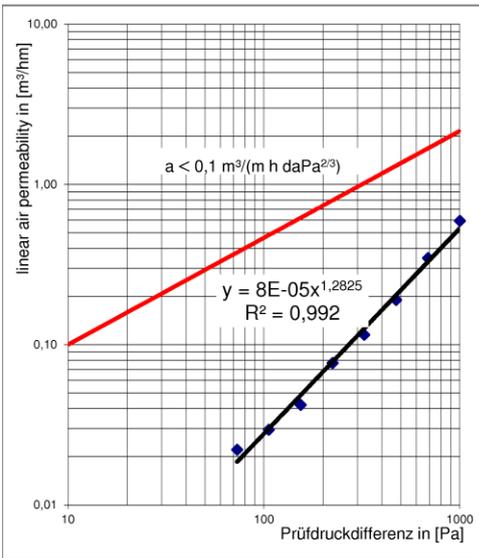
**Table B:** Air measurement, installation gaps not bonded

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m³/h	1,3	1,8	2,4	3,1	4,1	5,4	7,1	9,1	11,6

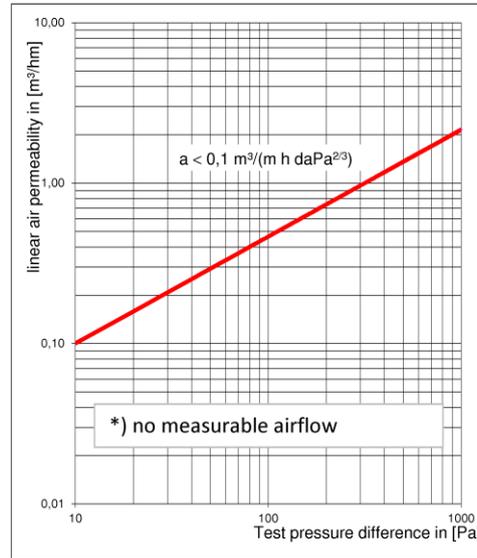
**Table C:** Difference of air permeability, Table B - Table A

Pressure difference in Pa	50	73	106	154	224	325	473	688	1000
Flow rate in m³/h	*)	*)	*)	*)	*)	*)	*)	*)	*)
Flow rate, in m³/hm	*)	*)	*)	*)	*)	*)	*)	*)	*)

\*) no measurable airflow



Graphics at positive wind pressure



Graphics at negative wind pressure

**Result:** Q10= 0,00 m³/hm  
 Q100= 0,00 m³/hm

**Result:** Q10= \*) m³/hm  
 Q100= \*) m³/hm

**Comments**

The external sealing level was bridged for the test. The connecting joint was opened towards the test chamber through holes in the frame.

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**Watertightness after load**

Project-No. 18-002553-PR02  
 Basis EN 1027:2016-03  
 Windows and doors - Watertightness - Test method  
 Test equipment Pst/020920 - Window and facade test rig  
 Test specimen Wall connection with sprayable sealant  
 Test specimen No. 46743-002  
 Date of test 22.11.2018  
 Test engineer in charge Martin Heßler  
 Test engineer Martin Heßler

Implementation of tests  
 Deviations There have been the following deviations from the test method specified in the standard/basis:  
 The test is made based on EN 1026, as the scope is not applicable.

Ambient conditions Temperature 19.5 °C Air humidity 38 % Air pressure 965 hPa  
 The ambient conditions are in accordance with the standard/basis requirements.

**Measurement data/Results**

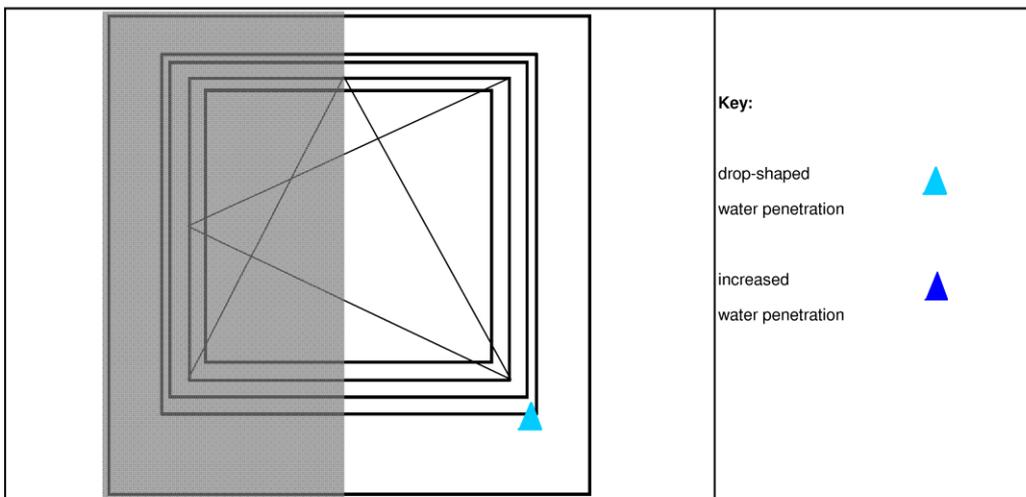
Test state: The test was made without internal connection and joint filling.

Clear opening of surround panel: 1630 mm x 1940 mm

Number of spray nozzles: 4

Amount of water: 480 l/h  
 0.48 m³/h

Three pressure pulses with 660 Pa were applied.



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**Table: Test**

Druck/Pa	Observation
0	water penetration via lower corner area, no water penetration on sides and at top.
50	as before
100	as before
150	as before
200	as before
250	as before
300	as before
450	as before
600	as before

**Result:**

There was no water penetration determined until 600 Pa over the evaluated area.

**Comments**

The lower attachment was not part of the test.

**Evidence of Performance**

Testing the joint characteristics of a sealing between window and building structure in new condition and after a series of simulated time-lapse short-term loads

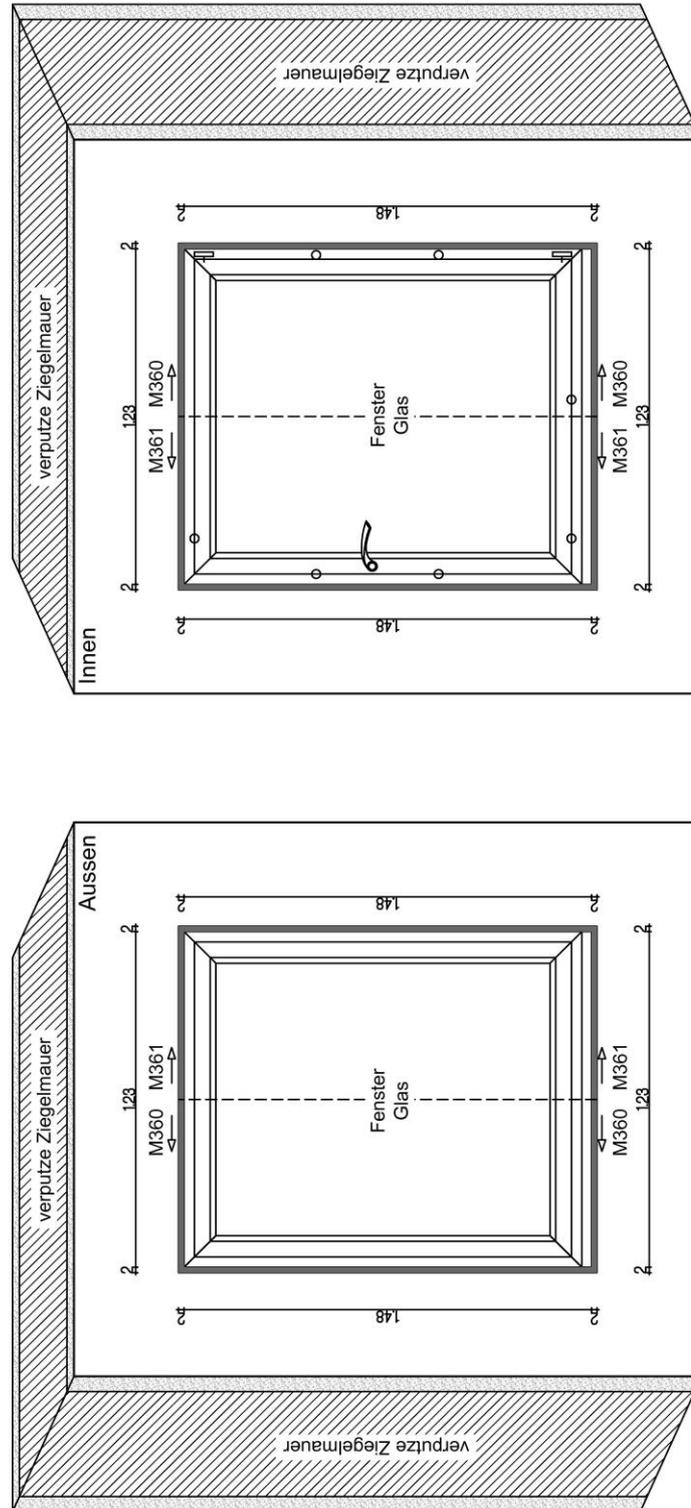
Test Report 18-002553-PR02 (PB 2-E03-020310-en-02) dated 18.03.2020

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**4 Representation of test specimen**

OTTOSEAL® M360  
 OTTOSEAL® M361



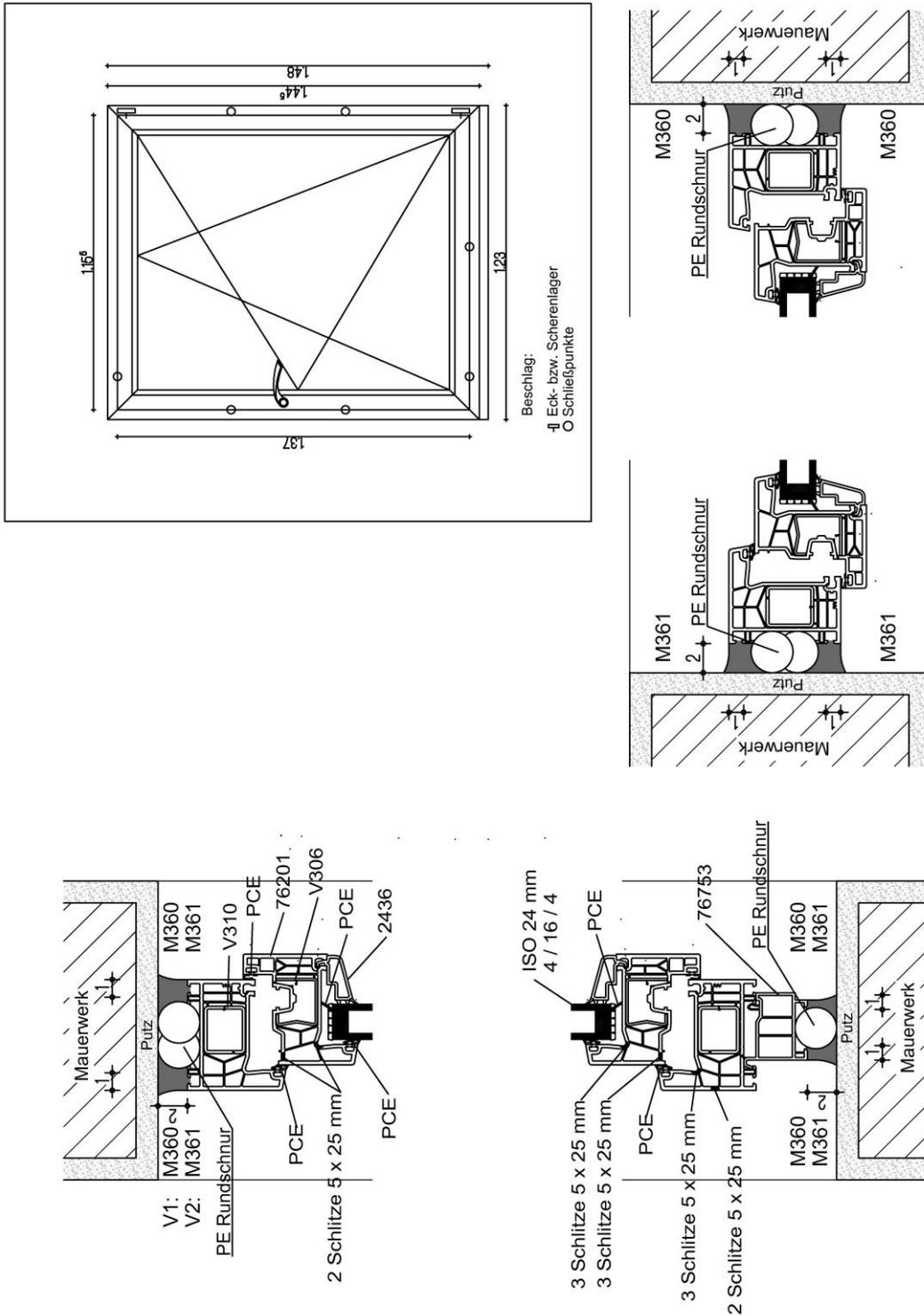
**Drawing 1**  
 Test specimen  
 Tested variant: OTTOSEAL M360

**Evidence of Performance**

Testing the joint characteristics of a sealing between window and building structure in new condition and after a series of simulated time-lapse short-term loads

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**Drawing 2**  
Sectional drawing of the test specimen  
Tested variant: OTTOSEAL M360

**Evidence of Performance**

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**Photo 1**  
Test specimen on test rig



**Photo 2**  
Detail view, backfilling of sealant joints



**Photo 3**  
Corner design of sealing, outside at top



**Photo 4**  
Corner design of sealing, outside at bottom (not part of the test)



**Photo 5**  
Corner design of sealing, room side at top



**Photo 6**  
Corner design of sealing, room side at bottom

**Evidence of Performance**

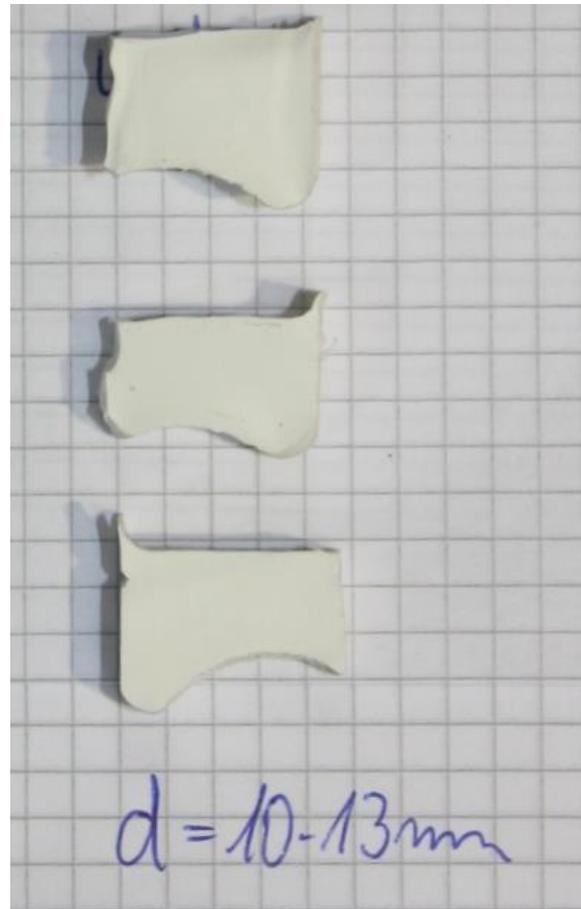
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**Photo 7**  
Test pieces of seal on room side after dismantling of frame



**Photo 8**  
Test pieces of external seal after dismantling of frame