



**BUILDING RESEARCH INSTITUTE (N I S I) Ltd.**

**NOTIFIED TEST LABORATORY**

**Identification number NB 2032 of the Register of EC**

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1618 Sofia, BULGARIA, 86 Nikola Petkov Blvd, tel.+359 2 856 10 82, fax +359 2 955 96 38, e-mail: nisi\_sofia@abv.bg

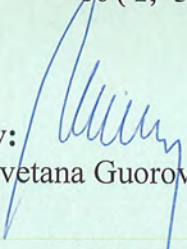
## **TEST REPORT**

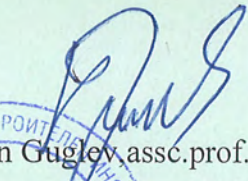
### **INITIAL TYPE TESTING**

**ITT-11.21 / 20.06.2011**

The tests are carried out in compliance with the Chapter Two of the Bulgarian *Regulation for the Essential Requirements to Constructions and Conformity Assessment of Construction Products (RERCCACP)* that bring into force the *Construction Products Directive (CPD) 89/106/EEC* of the Council of European Communities .

- Product:** Window of triple sandwich solid wood - system 72/86
- Producer and Applicant:** STIL-M1 Ltd  
85 Rakovski str., Sofia, Bulgaria
- Manufacturing site:** Factory of STIL-M1 Ltd  
Bania, Razlog Municipality
- Document for assignment:** Contract No 25/2011
- Conformity assessment system** System 3 according to Annex ZA of EN 14351-1
- Essential requirements:** 3 – hygiene, health and the environment;  
4 – safety in use;  
5 – protection against noise;  
6 – energy economy and heat retention (energy efficiency)
- Test samples:** One window with dimensions 3000/1800 mm. Details of the window are supplied in Annex 1.
- Test period:** From 16.05.2011 to 17.06.2011
- Conclusion:** The submitted Window of triple sandwich solid wood - system 72/86 meets watertightness class 9A, resistance to wind load class C2, load-bearing capacity devices class 4, air permeability class 4, acoustic performance – weighted sound reduction index  $R_w (C; C_{tr}) = 36 (-2; -5)$  dB; thermal transmittance  $U = 1,12 \pm 0,04$  W/(m<sup>2</sup>.K).

**Head of Test Laboratory:**   
Res. Ass. Eng. Tzvetana Guorova

**General Manager of NISI:**   
Dr.Eng. Rumén Guglev, assc.prof.

The Test Report consists of 15 pages. Copy of parts of the Test Report can be made with written consent of the NISI Ltd.





### 3. Hygiene, health and the environment

#### Test data:

No	Characteristic	Unit of measurement	Test method	Test result	Requirement according to EN 12208
1	2	3	4	5	6
1.	Watertightness in static test pressure P = 600 Pa *	class	EN 1027 Method 1A	9A	The requirements are given in Annex 2 of the test report.
* Detailed test results are given in Annex 2 of the test report.					

### 4. Safety in use

#### Test data:

No	Characteristic	Unit of measurement	Test method	Test result	Requirement according to technical specifications
1	2	3	4	5	6
1	Resistance to wind load *	class	EN 12211	C2	EN 12210
1.1	Deformation ( $F_p$ ) of the wing frame at wind load :			P = ± 800 Pa	P = ± 800 Pa f < (1/300) L
	- I-st vertical axis (point 2);	mm		+0,62 / -0,28	< ±5,73
	- II-nd vertical axis (point 5);	mm		+0,20 / -0,14	< ±75,3
	- III-rd vertical axis (point 8);	mm		+1,40 / -0,22	< ±5,73
	- IV-th vertical axis (point 11).	mm	+0,92 / -0,19	< ±5,73	
1.2	Repeated pressure test - 50 times positive and negative pressures	-		P = ± 400 Pa Functional qualities and links with hardware are reserved	P = ± 400 Pa Functional qualities of the window and links with hardware to be reserved
1.3	Safety test at triple pressure	-		P = ± 1200 Pa Functional qualities and links with hardware are reserved	P = ± 1200 Pa Functional qualities of the window and links with hardware to be reserved



No	Characteristic	Unit of measurement	Test method	Test result	Requirement according to technical specifications
1	2	3	4	5	6
2	Load-bearing capacity devices	class	EN 14609	4 **	EN 13115
2.1	Bending at load with a horizontal force for 5 min that is applied to the wing with hinges. The wing is rotated on a vertical axis and is locked at the top	mm		P = 350 N $a_{\text{residual}} = 2 \text{ mm}$  Functional qualities and links with hardware are reserved	P = 350 N  Functional qualities of the window and links with hardware to be reserved
* Detailed test results are given in Annex 3 of the test report. ** Detailed test results are given in Annex 4 of the test report.					

## 5. Protection against noise

### Test data:

No	Characteristic	Unit of measurement	Test method	Test result	Requirement according to technical specifications
1	2	3	4	5	6
1	Airborne sound insulation – weighted sound reduction index, $R_w (C; C_{tr})$ *	dB	EN ISO 10140-2**	36 (-2; -5) ***	-
* Weighted sound reduction index, $R_w (C; C_{tr})$ dB, according to EN ISO 717-1. ** EN ISO 10140-2 supersedes EN ISO 140-3. *** Detailed test results are given in Annex 5 of the test report.					

## 6. Energy economy and heat retention (energy efficiency)

### Test data:

No	Characteristic	Unit of measurement	Test method	Test result	Requirement according to technical specifications
1	2	3	4	5	6
1	Thermal transmittance coefficient: - the profile - the insulating glass unit - the window	$W/(m^2.K)$	EN ISO 10077-1	1,17 1,10 1,12 ±0,04	- - -
2	Air permeability *	class	EN 1026	4	EN 12207 The requirements are given at Annex 6 of the test report.



№	Characteristic	Unit of measurement	Test method	Test result	Requirement according to technical specifications
1	2	3	4	5	6
* Detailed test results are given in Annex 6 of the test report.					

**Technical documentation:**

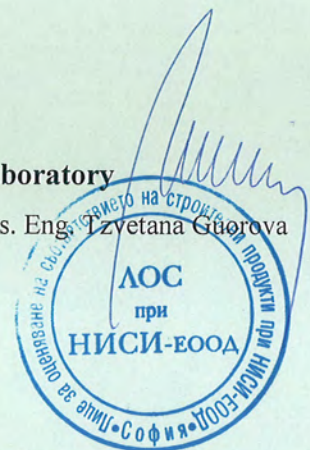
- EN 14351-1 Windows and doors. Product standard, performance characteristics. Part 1: Windows and external pedestrian doorsets without resistance to Fire and/or smoke leakage characteristics;
- EN 14609:2005 Windows. Determination of the resistance to static torsion;
- EN 12211:200 Windows and doors. Resistance to wind load. Test method;
- EN 1027:2003 Windows and doors. Watertightness. Test method;
- EN 1026:2003 Windows and doors. Air permeability. Test method;
- EN ISO 10140-2:2010 Acoustics. Laboratory measurement of sound insulation of building elements. Част 2: Measurement of airborne sound insulation;
- EN ISO 140-3:2010 Acoustics. Measurement of sound insulation in buildings and of building elements. Part 3: Laboratory measurements of airborne sound insulation of building elements;
- EN ISO 717-1:2003 Acoustics. Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation;
- EN ISO 10077-1: Thermal performance of windows, doors and shutters. Calculation of thermal transmittance. Part 1: Simplified method;
- EN 12210:2003 Windows and doors. Resistance to wind load. Classification;
- EN 13115:2004 Windows. Classification of mechanical properties. Racking, torsion and operating forces;
- EN 12208: 2003 Windows and doors. Watertightness. Classification;
- EN 12207:2003 Windows and doors. Air permeability. Classification.

**Tests are carried out by**

Res. Ass. Eng. K. Glushkova  
 Ass. Prof. Eng. B. Sapunov  
 Physicist N. Nikolov  
 Technician G. Atanasov

**Head of Test Laboratory**

Res. Ass. Eng. Tzvetana Gurova





**Data of window for testing**

**Name of product: Window of triple sandwich solid wood**

**Description of test specimen:** Three section window with dimensions 3000/1800 mm; right wing - uniaxial opening; middle part – no opening, left wing - uniaxial opening.

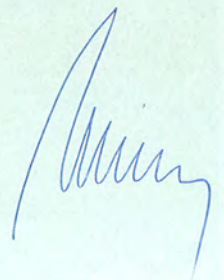
The window is produced according to the system IV 68 – triple sandwich profile of solid wood, frame dimensions 68/79 mm, wing dimensions 68/79 mm, with the technological channel drainage under insulating glass unit.

- Glazing - insulating glass unit produced of Rollplast with a total thickness 26 mm (4Ka/16/6), low-emissivity glass with shockproof film produced of LLumer-SCLSRPS7; the gap filled with argon, white float glass, glass unit seal with neutral silicone -KÖMMERLING; glass holder 23 mm.
- Seals (produced by Deventer, Germany) – the main seal is Deventer SP125 and the additional seal at the wing is Deventer SP33;
- Drainage – draining aluminum band with eloxation 2448 (produced by Gutmann, Germany), closed on both sides with sealing stoppers;
- Hardware (manufactured of MACO, Austria) with adjustable bearing hinges, fixed window bars with three point vertical compressions.

Specification of MACO hardware

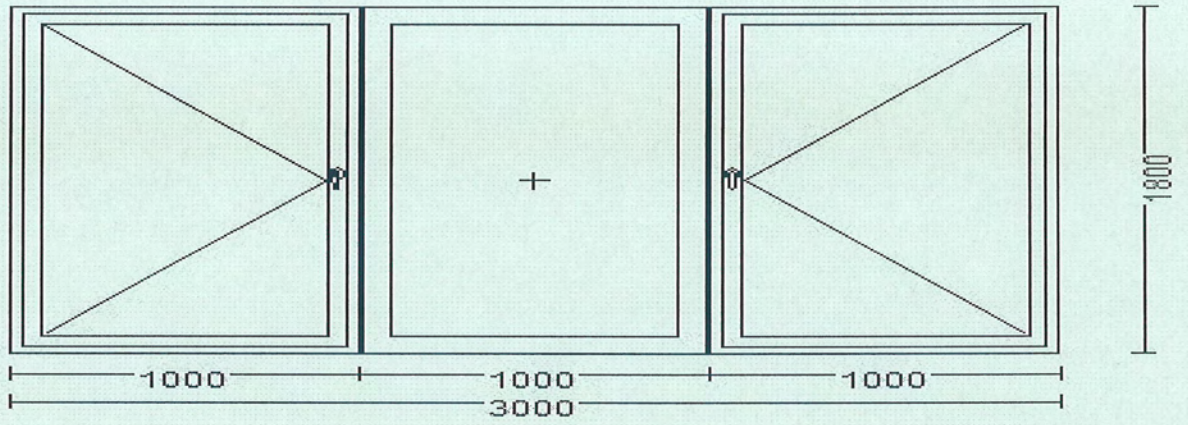
No in order	Article number	Number
1	42063	1
2	52706	1
3	52703	1
4	40756	2
5	40757	2
6	42060	1
7	42048	2
8	42057	2
9	42107	2
10	42099	2
11	28901	2
12	52389	2
13	94491	2
14	52707	1
15	52704	1
16	52702	2
17	202534	2
18	202543	2
19	34981	6
20	55368	2

*Note:* Detailed drawings of test specimen are given in page 6 to 8 of the test report.

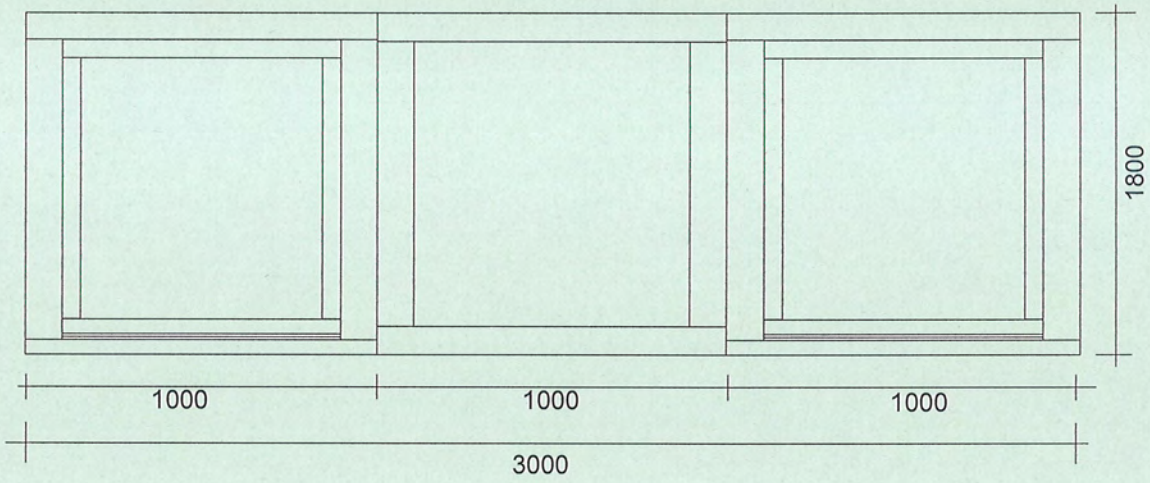




Inside

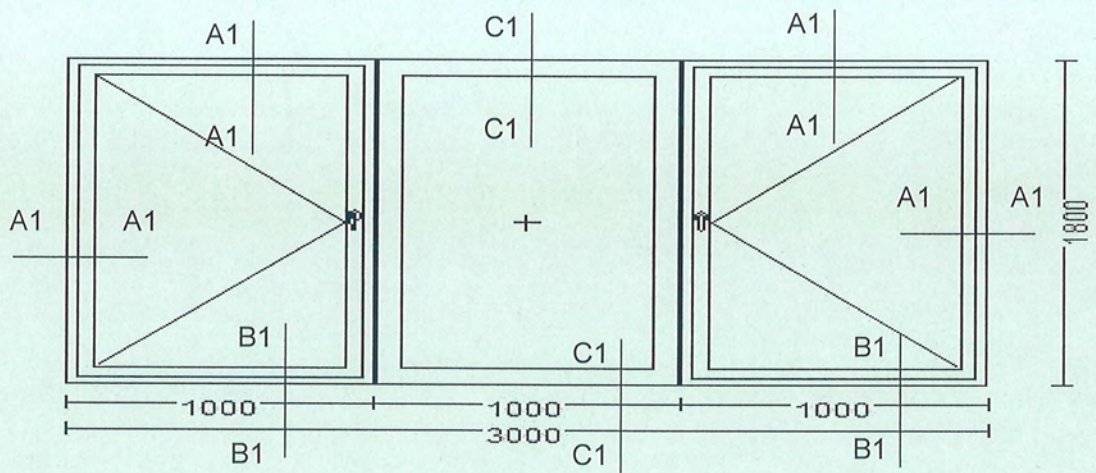


Outside

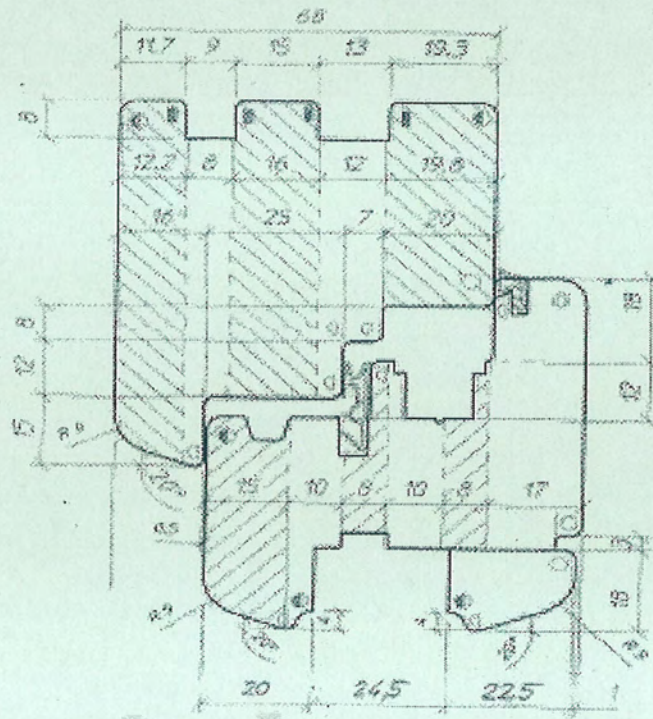




Typical sections



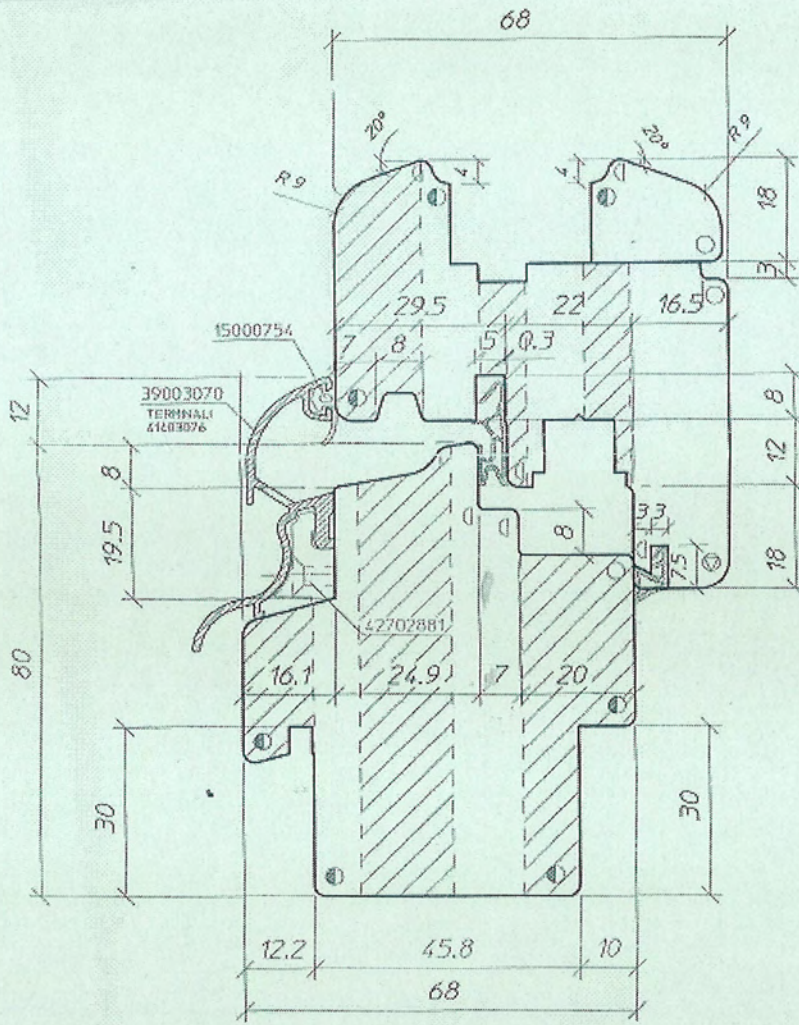
Section A1 - A1



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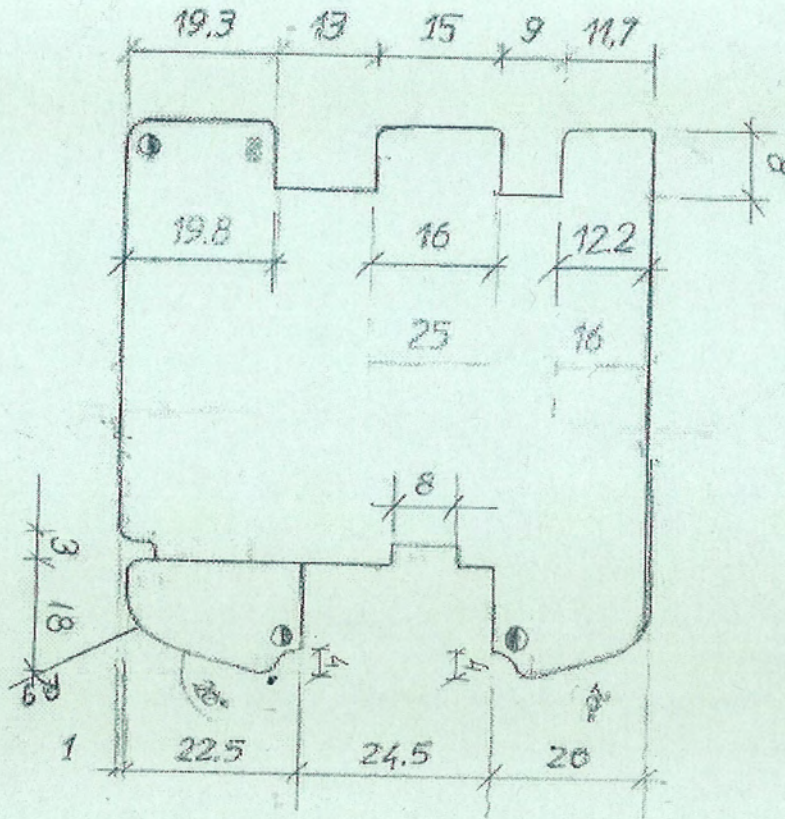
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Section C1 - C1



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## Watertightness – EN 1027

### 1. Test conditions and test equipment data

The test is carried out on a stand system "Rosenheim" type "VH AE" of HOLTEN located in the Laboratory "Building Physics" at NISI Ltd. The stand consists of a chamber and control and measurement desk. The chamber is airtight and only one of the sides is open. This side is closed by appropriate fixing of testing window that is oriented to the outside of the chamber.

The testing window is fixed to the spacers (the chamber sides) by manual clamps. Microporous rubber seals are used between the window frame and the chamber walls for good seal.

Water quantity – 2 dm<sup>3</sup> per 1 m<sup>2</sup>/min.

Air temperature in the chamber and the laboratory is 20 °C.

Relative humidity in the chamber and the laboratory is 50 %.

### 2. Test results

Test pressure, Pa	Continuance, min	Results of the monitoring on the internal face of the test specimen	Classification	Requirements according to EN 12208
0	15	Water resistant	1A	Water resistant at water spray for 15 min
50	5	Water resistant	2A	As class 1A + 5 min
100	5	Water resistant	3A	As class 2A + 5 min
150	5	Water resistant	4A	As class 3A + 5 min
200	5	Water resistant	5A	As class 4A + 5 min
250	5	Water resistant	6A	As class 5A + 5 min
300	5	Water resistant	7A	As class 6A + 5 min
450	5	Water resistant	8A	As class 7A + 5 min
600	5	Water resistant	9A	As class 8A + 5 min



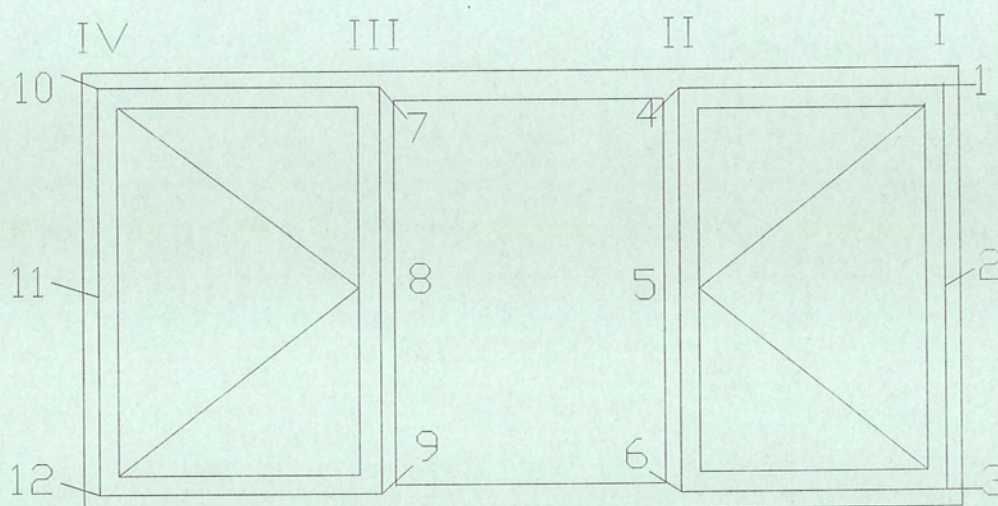
## Resistance to wind load – БДС EN 12211

### 1. Test conditions and equipment data

The test equipment and the chamber are in accordance with Annex 2 of the test report.  
Air temperature in the chamber and the laboratory is 19 °C.  
Relative humidity in the chamber and the laboratory is 54 %.

### 2. Testing of deformation (deflections)

Measurement of deformations (deflections) of the linear elements in height of the window wings is made using measuring devices type TGL 7682 accurate to 0,01 mm (produced of SUHL, Germany).



Disposition scheme of measuring points on the window



Test results:

Test pressure, Pa	Deflection in mm		
	I-st vertical axis		
	$F_p$ ( $F_{p\ res}$ ) at p.1	$F_p$ ( $F_{p\ res}$ ) at p.2	$F_p$ ( $F_{p\ res}$ ) at p.3
+400 / -400	+0,12 / -0,11 (+0,01/-0,03)	+0,28 / -0,20 (+0,02/-0,01)	+0,14 / -0,13 (+0,01/-0,02)
+800 / -800	+0,41 / -0,24 (+0,02/-0,04)	+1,03 / -0,56 (+0,12/-0,08)	+0,41 / -0,32 (+0,04/-0,02)
	II-nd vertical axis		
	$F_p$ ( $F_{p\ res}$ ) at p.4	$F_p$ ( $F_{p\ res}$ ) at p.5	$F_p$ ( $F_{p\ res}$ ) at p.6
+400 / -400	+0,39 / -0,33 (+0,02/-0,03)	+0,92 / -0,21 (+0,01/0,00)	+0,24 / -0,21 (+0,01/0,00)
+800 / -800	+0,95 / -0,76 (+0,04/0,00)	+0,54 / -0,48 (+0,03/-0,03)	+0,54 / -0,48 (+0,03/-0,03)
	III-th vertical axis		
	$F_p$ ( $F_{p\ res}$ ) at p.7	$F_p$ ( $F_{p\ res}$ ) at p.8	$F_p$ ( $F_{p\ res}$ ) at p.9
+400 / -400	+0,47 / -0,44 (+0,02/-0,05)	+1,13 / -0,97 (+0,03/-0,03)	+0,32 / -0,29 (+0,02/-0,03)
+800 / -800	+0,99 / -0,92 (+0,04/-0,10)	+2,22 / -1,02 (+0,04/-0,07)	+0,65 / -0,67 (+0,02/-0,06)
	IV-th vertical axis		
	$F_p$ ( $F_{p\ res}$ ) af p.10	$F_p$ ( $F_{p\ res}$ ) af p.11	$F_p$ ( $F_{p\ res}$ ) af p.12
+400 / -400	+0,21 / -0,18 (+0,02/-0,04)	+0,64 / -0,44 (+0,10/-0,07)	+0,15 / -0,11 (0,00/-0,02)
+800 / -800	+0,51 / -0,36 (+0,06/-0,11)	+1,38 / -0,81 (+0,12/-0,14)	+0,41 / -0,26 (+0,04/-0,08)

\*  $F_{p\ res}$  is residual deflection.

### 3. Repeated pressure test

The test is implemented at a pressure of  $\pm 400$  Pa, repeated 50 times.

At the repeated 50 cycles test including negative and positive pressure of 400 Pa, that simulate the window behavior at the wind blows (pressure and suction) defects and damages that deteriorate the window performance are not detected.

### 4. Safety test at triple pressure

The test is carried out at positive and negative pressure  $\pm 1200$  Pa only once.

Damages that deteriorate the window performance are not detected during the safety test at triple pressure.



## Load-bearing capacity devices – БДС EN 14609

### 1. Test equipment data

Deformations of the linear elements of the wings are measured by inductive displacement sensors type TS 50 W accurate to 0,01 mm and amplifier of carrier frequency KWS 673 A4 (produced of HBM, Germany).

### 2. Test results

**2.1** Bending load with a horizontal force  $F$ , in N, for 5 min, applied to the bottom of the wing with hinges. The wing rotates on a horizontal axis locked at the top.

$F = 20$  N:  $a_0 = 108$  mm

$F = 200$  N:  $a_1 = 184$  mm;  $a_1 - a_0 = 76$  mm;  $a_{\text{residual}} = 0$  mm

$F = 250$  N:  $a_1 = 198$  mm;  $a_1 - a_0 = 90$  mm;  $a_{\text{residual}} = 1$  mm

$F = 300$  N:  $a_1 = 214$  mm;  $a_1 - a_0 = 106$  mm;  $a_{\text{residual}} = 2$  mm

$F = 350$  N:  $a_1 = 221$  mm;  $a_1 - a_0 = 113$  mm;  $a_{\text{residual}} = 2$  mm

**Functional qualities and links with overlaid are reserved.**



**Airborne sound insulation – EN ISO 10140-2, EN ISO 717-1**

**1. Test conditions, test facilities and equipment data**

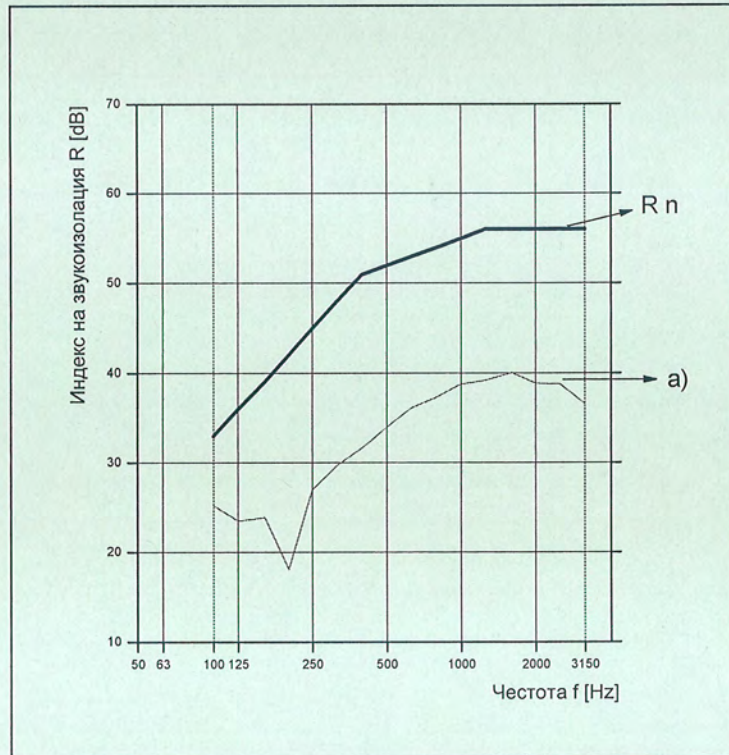
The test is carried out at “Building physics” laboratory:

- Air temperature 24 °C; relative humidity 60 %
- Source room V = 170 m<sup>3</sup>;
- Receiving room V = 119 m<sup>3</sup>;
- Filling wall with R<sub>w</sub> = 50 dB;
- Acoustic equipment “Brüel & Kjær” - Denmark:
  - Analyzer for building acoustics Type 4418;
  - Microphone Type 4943;
  - Preamplifier Type 2916;
  - Source noise Type 4224;
  - Sound calibration Type 4230.

The test specimen is installed by the specialists of Applicant.

**2. Test results**

f, Hz	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
R, dB	25,2	23,5	23,9	18,1	27,0	29,7	31,7	34,0	36,2	37,4	38,8	39,2	40,1	38,9	38,8	36,6



**WEIGHTED SOUND REDUCTION INDEX**

$R_w (C; C_{tr}) = 36 (-2; -5) \text{ dB}$



Annex 6

**Air permeability – EN 1026**

**1. Test conditions and test equipment data**

The test equipment is in accordance with Annex 2 of the test report.

Air temperature in the receiving room is 17 °C.

Relative humidity in the receiving room is 88 %.

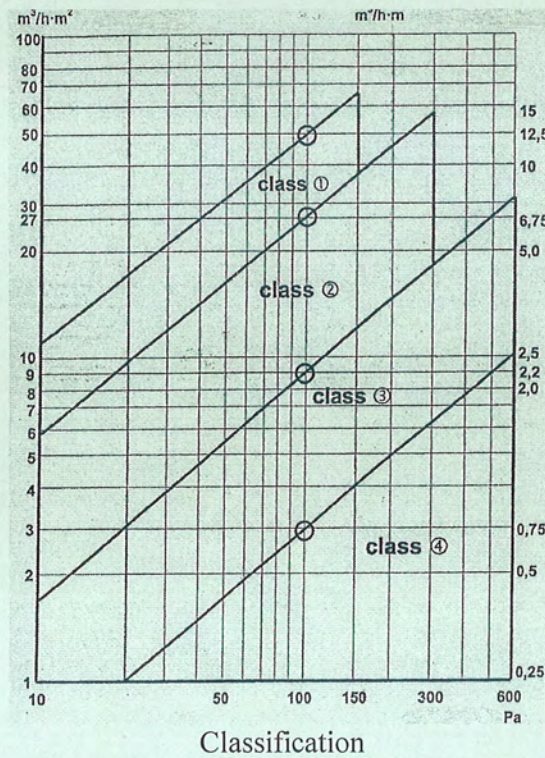
**2. Test results**

Length of opening joints – 10,52 m, overall window area – 5,21 m<sup>2</sup>

P, Pa	50	100	150	200	250	300	400	500	600
V, m <sup>3</sup> /h	1,70	2,70	3,20	4,20	4,90	5,50	7,10	7,70	8,10
V <sub>1</sub> , m <sup>3</sup> /hm	0,16	0,25	0,30	0,37	0,43	0,52	0,67	0,73	0,77
V <sub>w</sub> , m <sup>3</sup> /hm <sup>2</sup>	0,31	0,49	0,63	0,77	0,96	1,08	1,36	1,52	1,57

Air permeability – classification:

- overall area – class 4;
- length of opening joints – class 4.



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