

**Testing and Calibration
Laboratory****TEST REPORT****Number: B/2017/26 of 15.02.2017****Subject:** Research of mechanical properties of the PP polypropylene glass panels and wedges –
compression strength.**Research were executed for:** **PGB-EUROPE NV**, Gontrode Heirweg 170, 9090 Melle, Belgium.**Research were executed in:** Institution for Research and Certification „ZETOM” Ltd. in Katowice
Testing and Calibration Laboratory. Mechanical Laboratory.Index of client's order: **Order the implementation of research** of **26.01.2017**

The order was registered in laboratory under the number: B/2017/23

Research began: 26.01.2017 **Research finished:** 15.02.2017

The report include: 15 pages

3 copies was given, which receive:

1. PGB-EUROPE NV, Gontrode Heirweg 170, 9090 Melle, Belgium.
2. PGB-EUROPE NV, Gontrode Heirweg 170, 9090 Melle, Belgium.
3. LT

Supervision of test was performed by: Dr Katarzyna HadamResearch and tests was performed by: Eng. Tomasz Gruszczyński in laboratory: WM
MSc Eng. Krzysztof Szykowski in laboratory: WM**The report was prepared by:** MSc Eng. Krzysztof Szykowski**Authorized:****PRACOWNIA
MECHANICZNA**

Inż. Tomasz Gruszczyński

**Confirmed:**p.o. Z-ca Dyrektora
ds. Badań i Wpływów
Kierownik Laboratorium
Badawczego i Wzorcującego

dr Katarzyna Hadam

**Institution for Research and Certification „ZETOM”
named after. Prof. F. Stauba in Katowice sp. z o.o.
Institutions for Research and Certification “ZETOM” Ltd.
Notified Body in the European Union No 1436,
In the scope of low voltage, machinery and construction**

**Ks. Bpa H. Bednorza 17; 40-384 Katowice
phone: 0048(032) 2569-257, 0048(032) 2569-273, 0048(032) 2569-353**

ARRANGEMENTS

A. Obligatory:

1. Testing report is a property of a client for whom the research was done.
2. Testing report and information which it includes can be used with the report owner's consent only.
3. Research report can be used as a whole only.
4. All testing and measure results, listed in the report, refer only to the tested objects and aren't synonymous with object's quality approval.
5. The work was done according to the its quality plan and to quality system requirements in accordance with Quality Manual of Testing and Calibration Laboratory.
6. Once referring to the objective report a following (or equivalent) sentence must occur (be applied):

Tested by Testing and Calibration Laboratory in Katowice, accredited by Polish Accreditation Center, Warsaw in the scope which conforms with the attachment to the certificate Nr AB 024.

B. Additionally (listed in the report content) paragraph

C. Special cases (listed in the report content) paragraph

Reports owner, using its content is obligated to quote information, that he use results obtained by Testing and Calibration Laboratory of Institutions for Research and Certification „ZETOM” Ltd, accredited by Polish Accreditation Centre.

1. BASIC RESEARCH

1.1. The name of document of order: order for the execution of research in Testing and Calibration Laboratory "ZETOM" Ltd. Katowice by PGB-EUROPE NV Melle Belgium.

1.2. Document identification of order : Order the implementation of research of 26.01.2017

1.3. Concerning: research of compression strength.

2. RESEARCH AIM Determine of compression strength.

3. RESEARCH OBJECT

- 3.1. The name of object:** PP glass panels, width 22 mm, length 95 mm, thickness: 1, 2, 3, 4 and 5 mm and PP wedges: little, medium and big.
Quantity: $\Sigma 51$ pieces = 5 x 3 pieces + 3 x 12 (6 x 2) pieces
- 3.2. Customer/Producer:** PGB-EUROPE NV, Gontrode Heirweg 170, 9090 Melle, Belgium.
- 3.3. Supplier:** PGB-EUROPE NV, Gontrode Heirweg 170, 9090 Melle, Belgium..
- 3.4. Production plant:** —
- 3.5. The way of the research object delivery:** through producer
- 3.6. Objects collected from:** —
- 3.7. Sampling protocol:** without protocol
- 3.8. Date of object receipt for research:** 26.01.2017
- 3.9. Extra marking through receiver:** —
- 3.10. The packing specification of object:** foil bags, paper-board envelope
- 3.11. The marking of objects in laboratory:**

The marking of objects in laboratory:

Object marking	Objects marking executed in laboratory ¹⁾	Remarks
PP glass panels of thickness:	Mechanical properties	
1 mm white Samples no.: 1, 2, 3.	2017/23/ 1 ₁₊₃	- test samples for research in "ZETOM" Ltd. Katowice
2 mm blue Samples no.: 1, 2, 3.	2017/23/ 2 ₁₊₃	
3 mm red Samples no.: 1, 2, 3.	2017/23/ 3 ₁₊₃	
4 mm yellow Samples no.: 1, 2, 3.	2017/23/ 4 ₁₊₃	
5 mm green Samples no.: 1, 2, 3.	2017/23/ 5 ₁₊₃	
PP wedges ²⁾ :		
little white Samples no.: 1, 2, 3, 4, 5, 6.	2017/23/ 1 ₁₊₆	
medium grey Samples no.: 1, 2, 3, 4, 5, 6.	2017/23/ 2 ₁₊₆	
big black Samples no.: 1, 2, 3, 4, 5, 6.	2017/23/ 3 ₁₊₆	
¹⁾ determine still sample index		

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4. RESEARCH PROGRAM.

- 4.1. Test of compression strength by
Instructions for Research QL_{IB} – 1310 edition 01 of 15.11.2012.

5. THE TEST EQUIPMENT.

5.1. To test mechanical properties:

- testing machine

- Id. No.: 1004001

6. DESCRIPTION AND RESULTS.

6.1. Tasting machine

The tests were carried out on the testing machine INSTRON TT DM with a modernized measurement system extension and load. Max load 100 kN. The testing machine fulfils requirements according to the first class of the PN-EN ISO 7500-1 standard. A resolution of the measurement system of load is 0,01kN.

A resolution of the measurement system of extension is 0,001mm.

6.2. Samples

According to information from client the glass panels and wedges were made of PP - polypropylene.

The dimensions of the glass panels were: thickness x width x length = 1, 2, 3, 4, 5 x 22 x 95 mm **photo.no1.**

The dimensions of the wedges were: little (white) 14 x 30 x 90 mm, medium (grey) 15 x 43 x 95 mm, big (black) 22 x 43 x 150 mm **photo. no 2.**

6.3. Run of the compression tests.

An example of compression test of the glass panel is presented on **photo no. 3.**

The compression tests of the wedges were done in two ways:

- contact surface of the bottom wedge and top wedge is total (100%) **photo no. 4**
- contact surface of the bottom wedge and top wedge is fragmentary (35%) **photo no. 5.**

The run of the compression tests are presented as load-extension graphs:

- for the glass panels, **figures no. 1, 2, 3, 4 and 5**
- for the wedges, **figures no. 6, 7, 8, 9, 10 and 11.**

6.4. Results.

The results of the compression tests are given in **tables no.1 and 2.**

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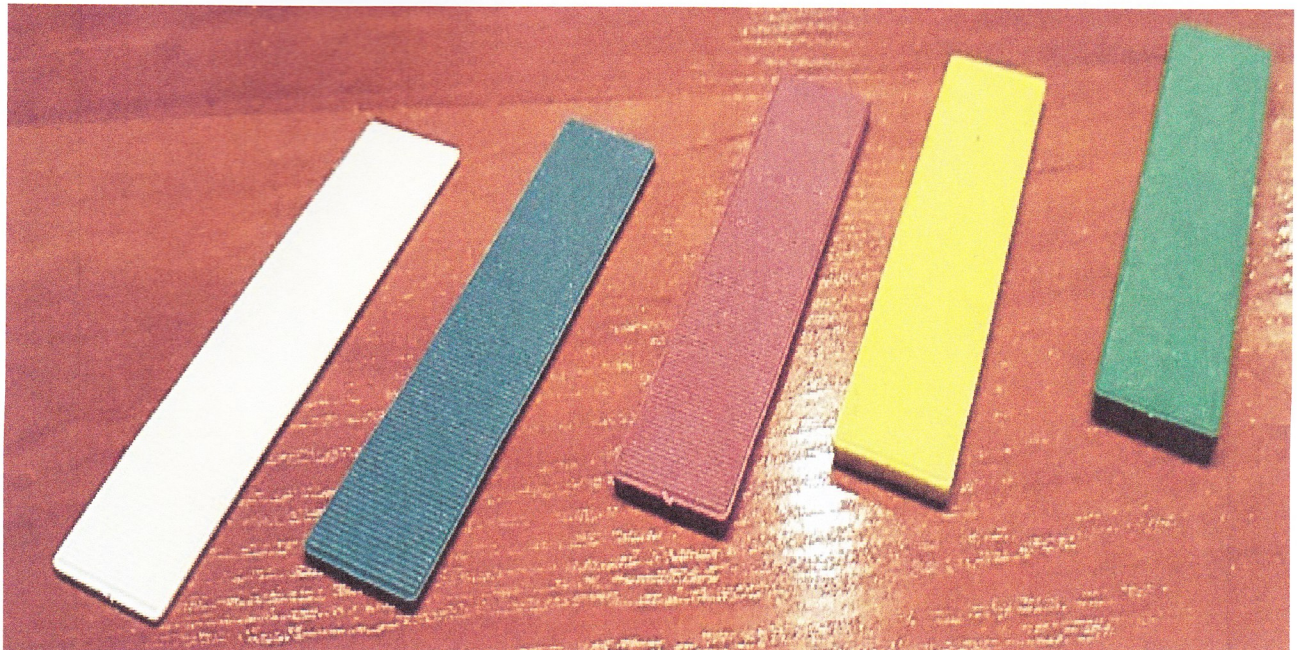


Photo. 1. Samples of the glass panels to compression tests.

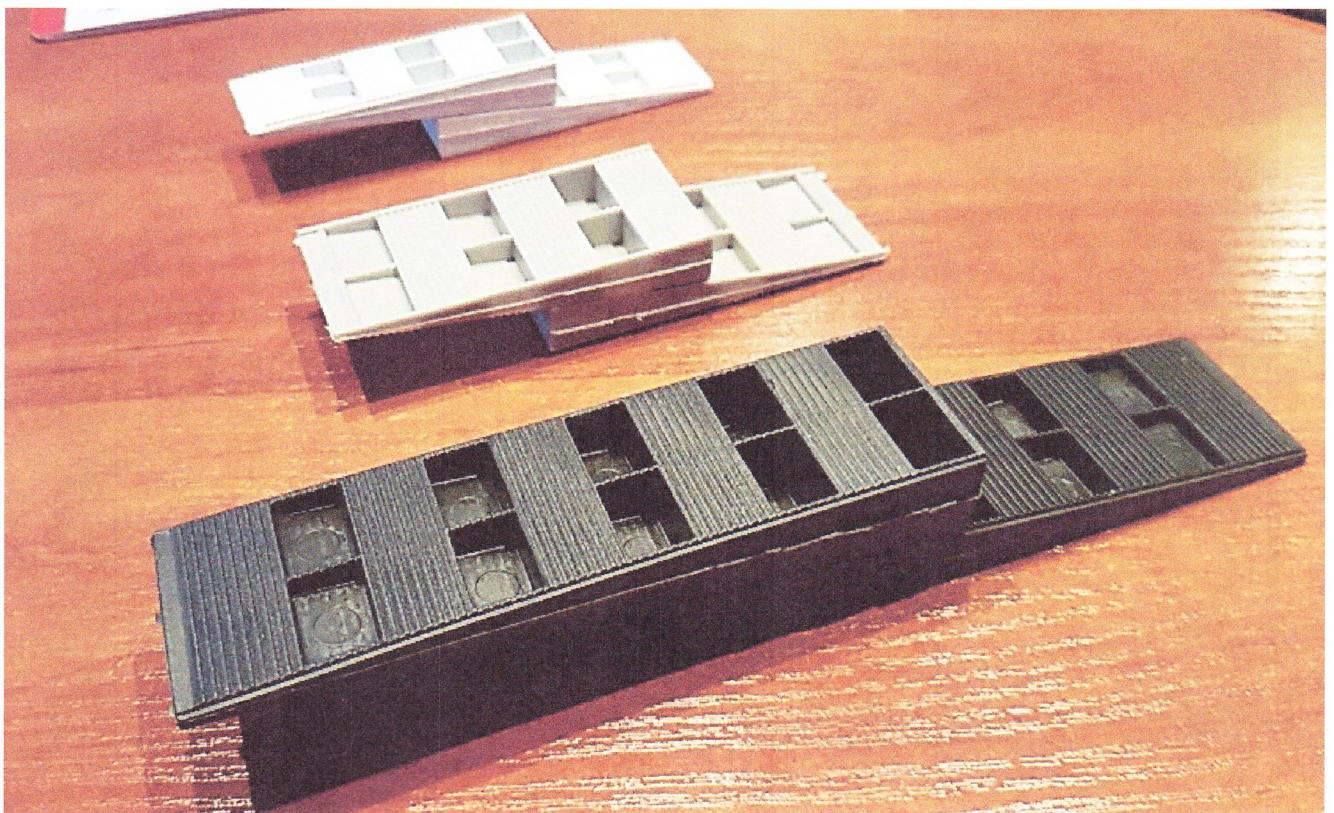
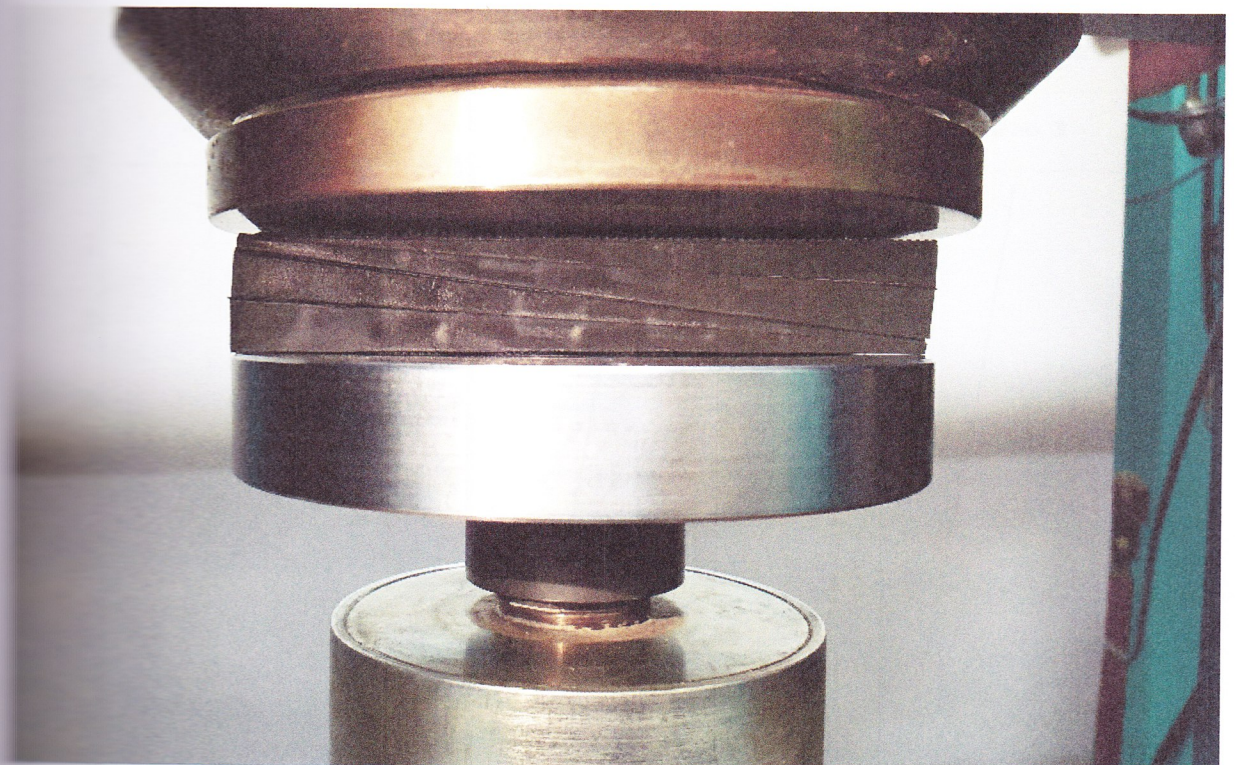
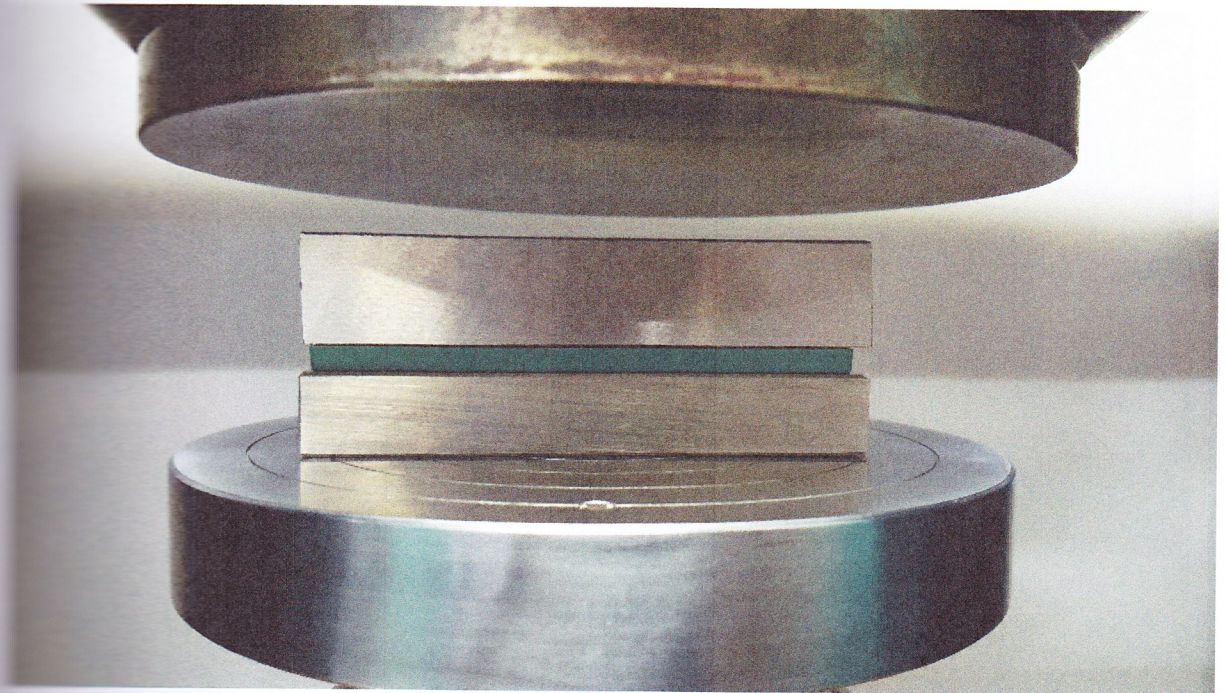


Photo. 2. Samples of the wedges to compression tests.

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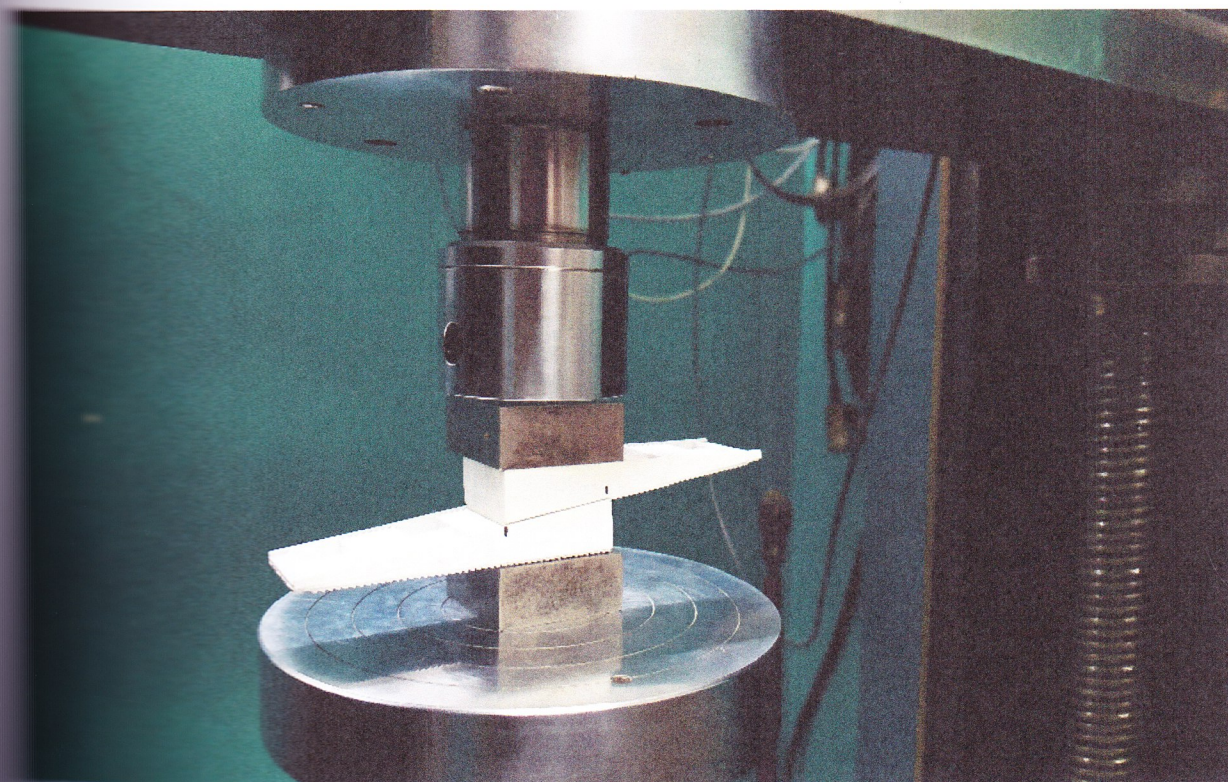


Photo. 5. Compression test of the little (white) wedges – 35% contact surface.

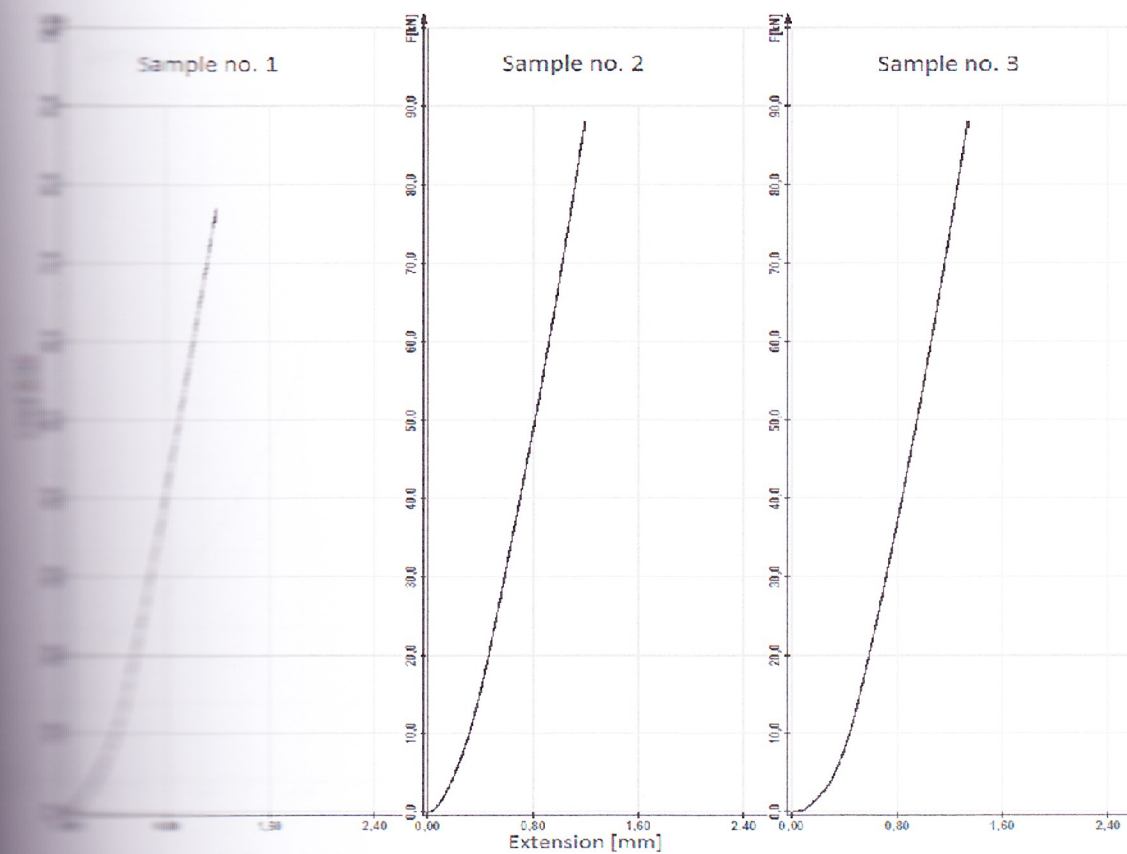


Fig. 1. Compression test of the glass panels – thickness 1 mm.

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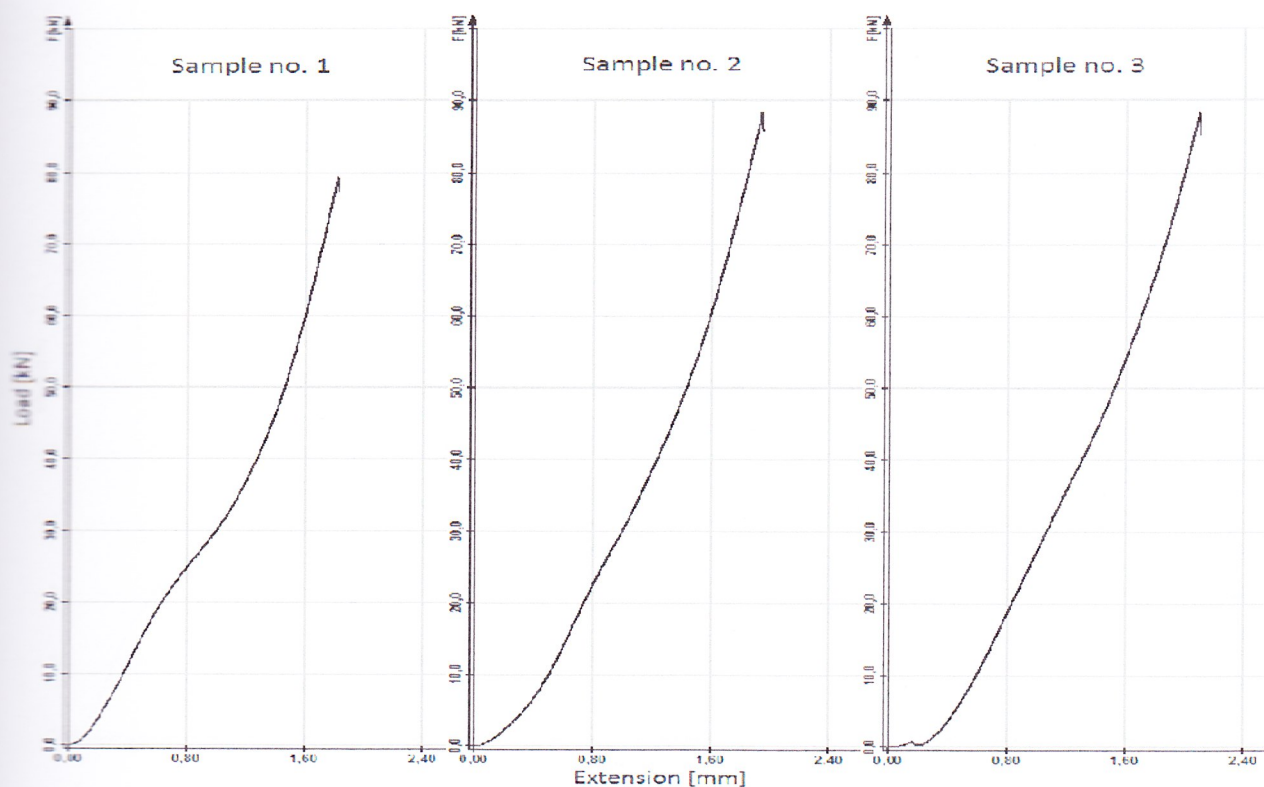


Fig. 2. Compression test of the glass panels – thickness 2 mm

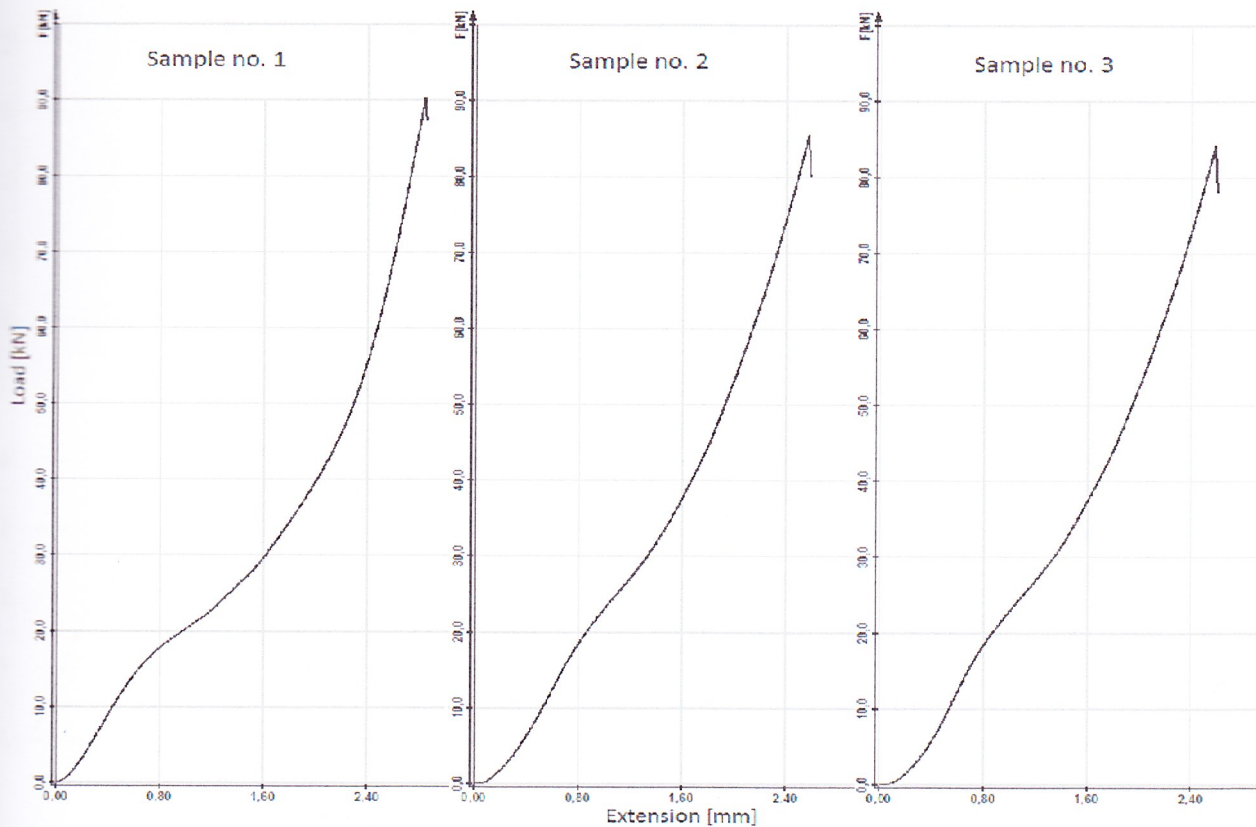


Fig. 3. Compression test of the glass panels – thickness 3 mm.

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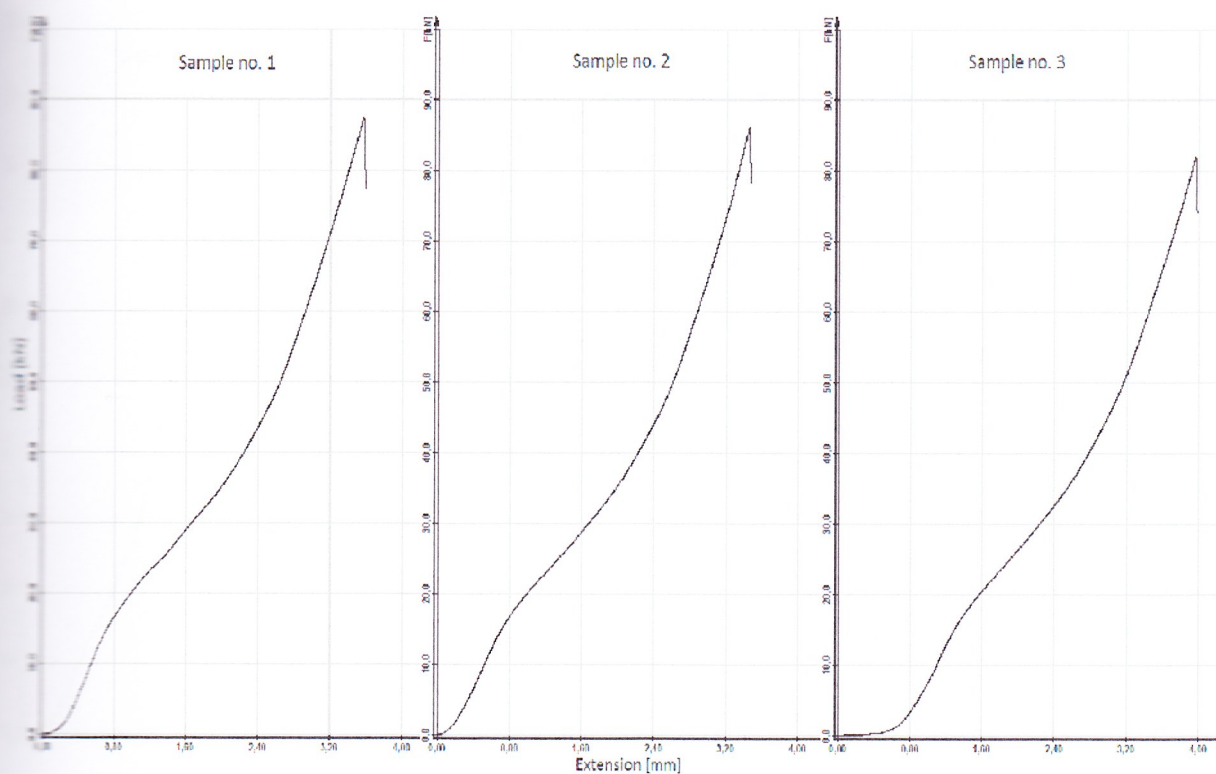


Fig. 4. Compression test of the glass panels – thickness 4 mm.

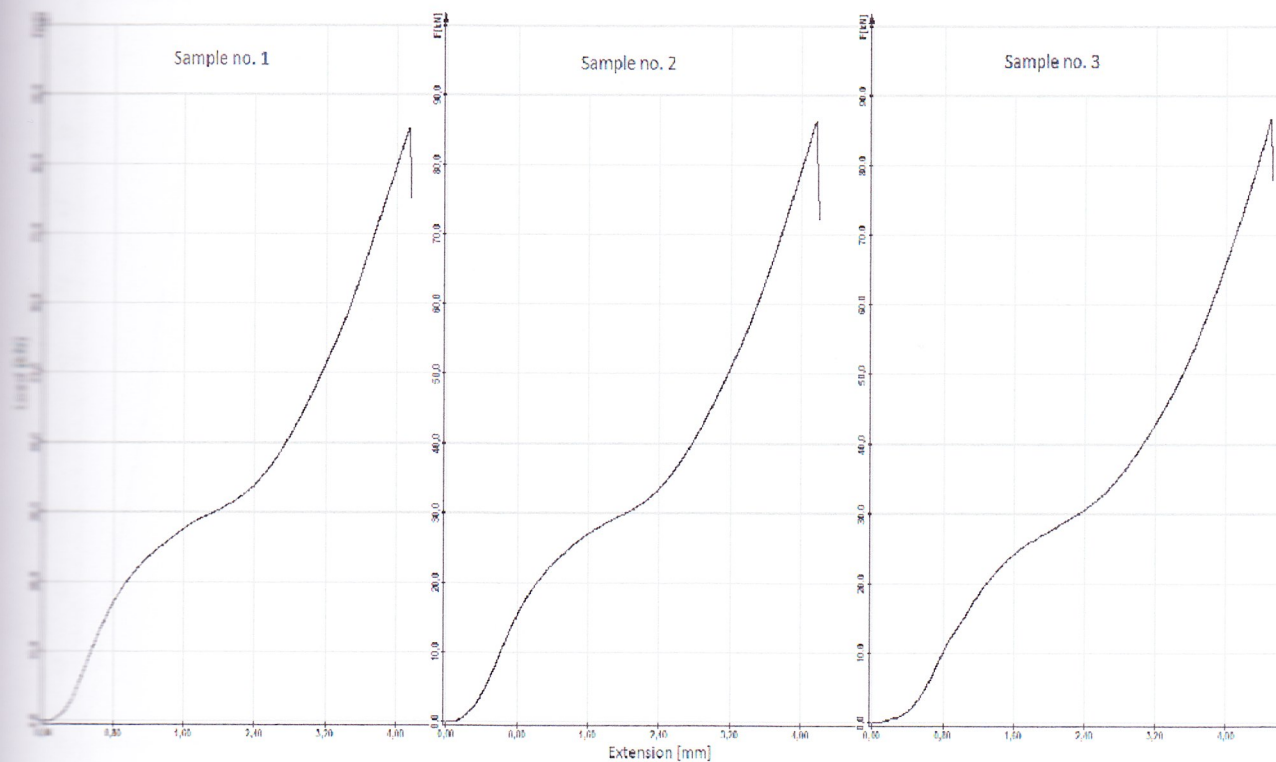


Fig. 5. Compression test of the glass panels – thickness 5 mm.

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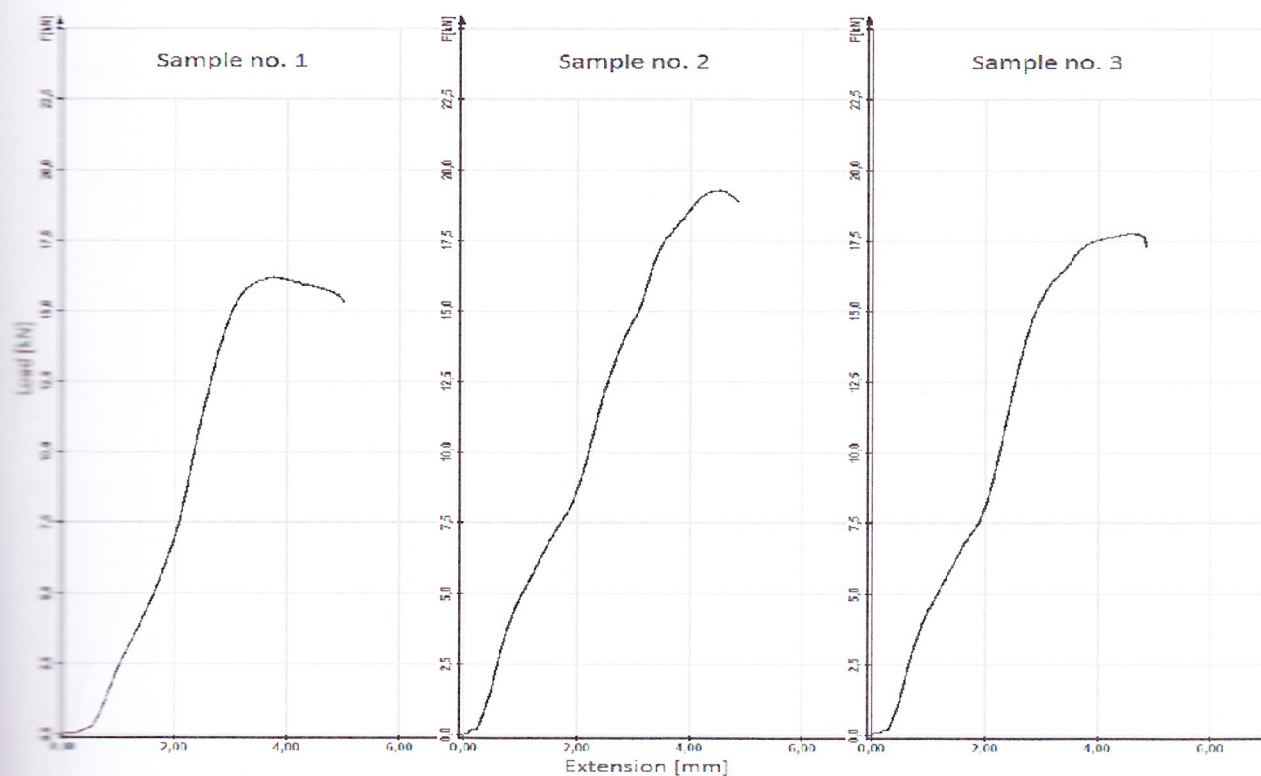


Fig. 6. Compression test of the little (white) wedges – 100% contact surface.

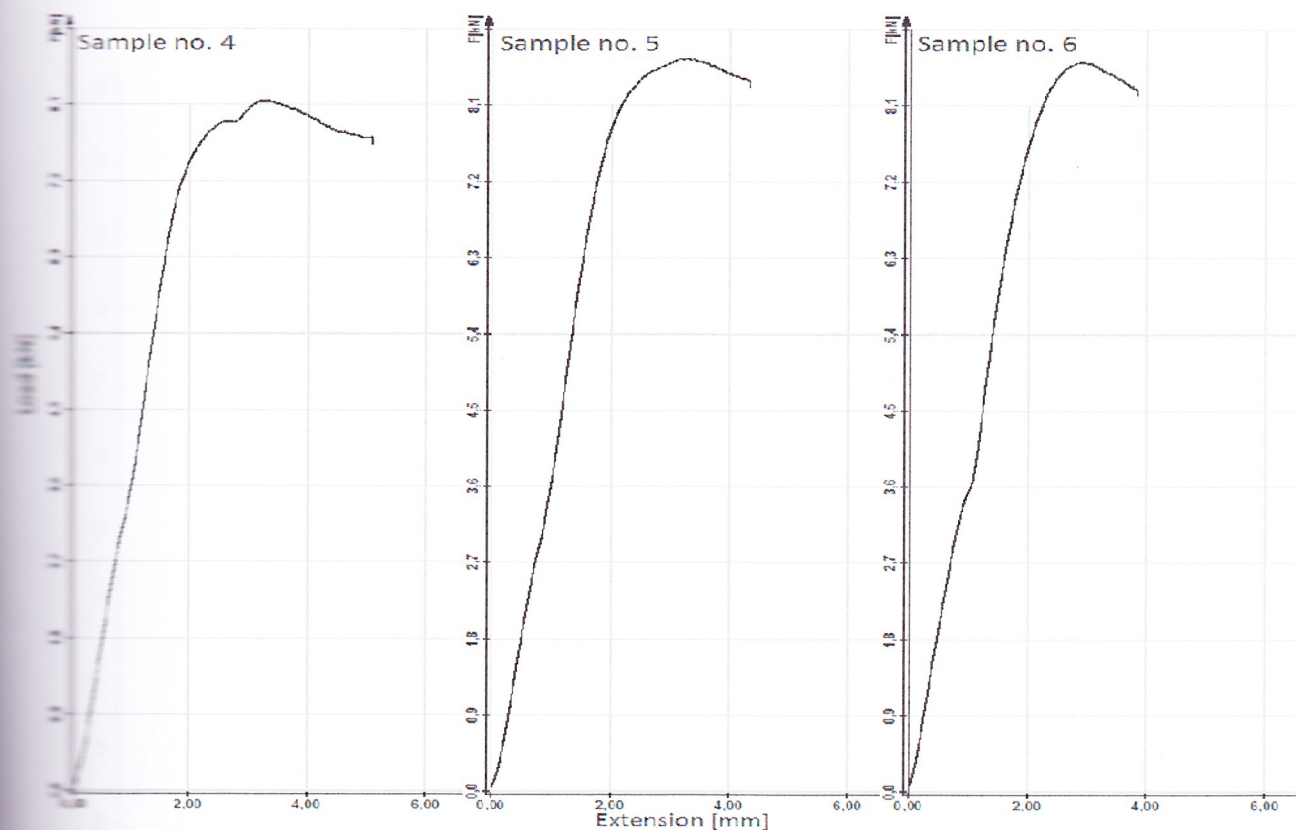


Fig. 7. Compression test of the little (white) wedges – 35% contact surface.

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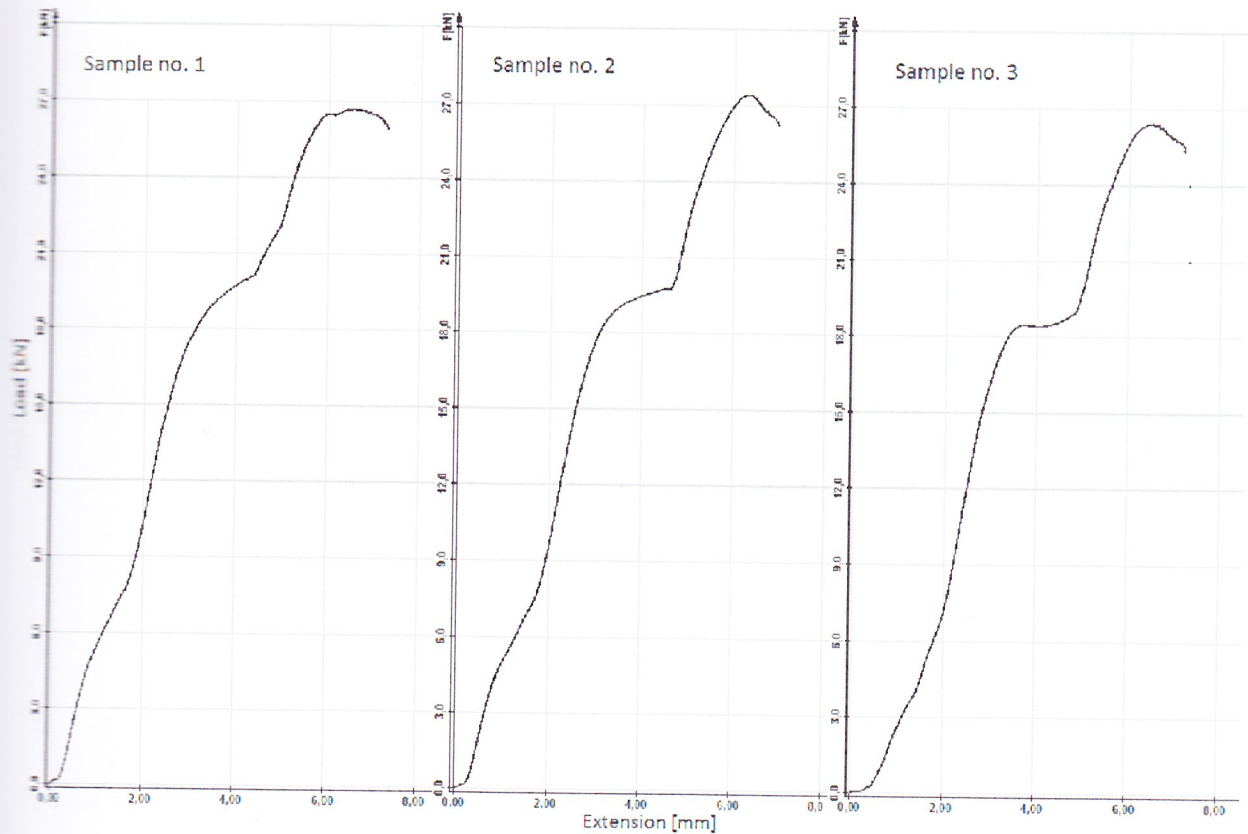


Fig. 8. Compression test of the medium (grey) wedges – 100% contact surface.

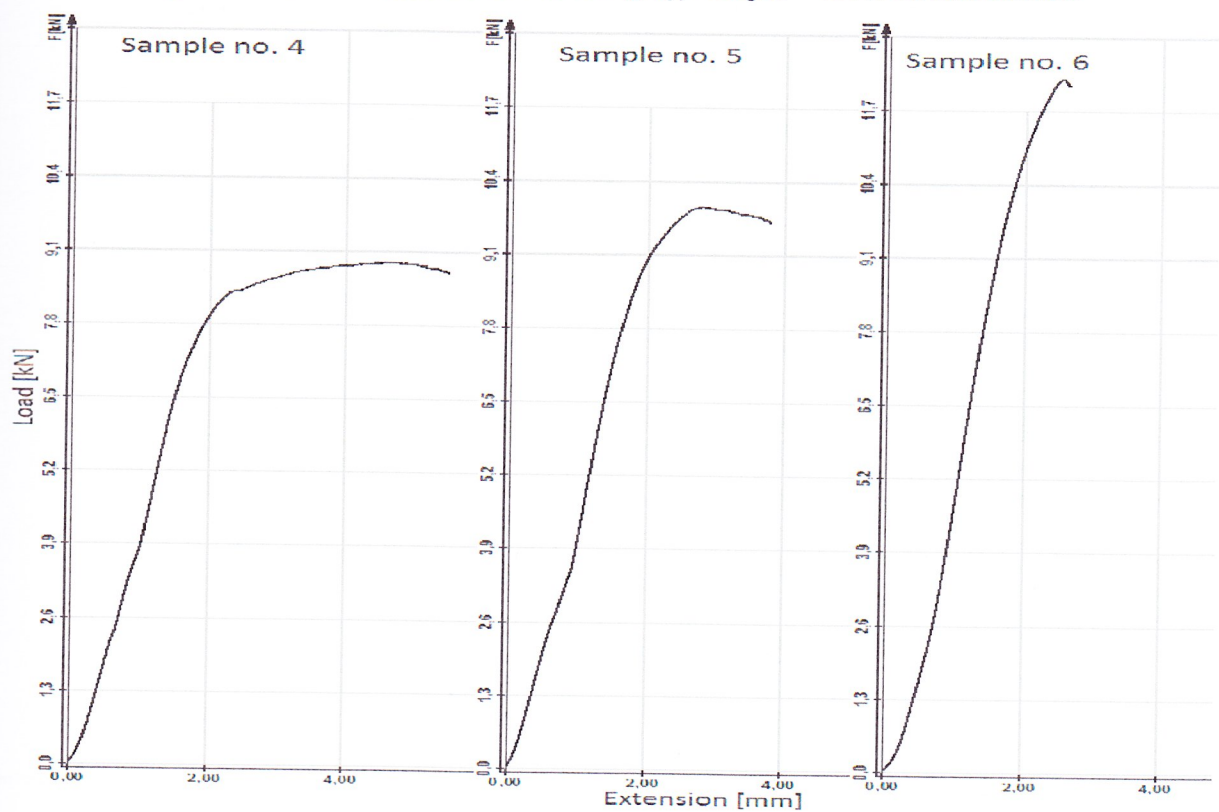


Fig. 9. Compression test of the medium (grey) wedges – 35% contact surface.

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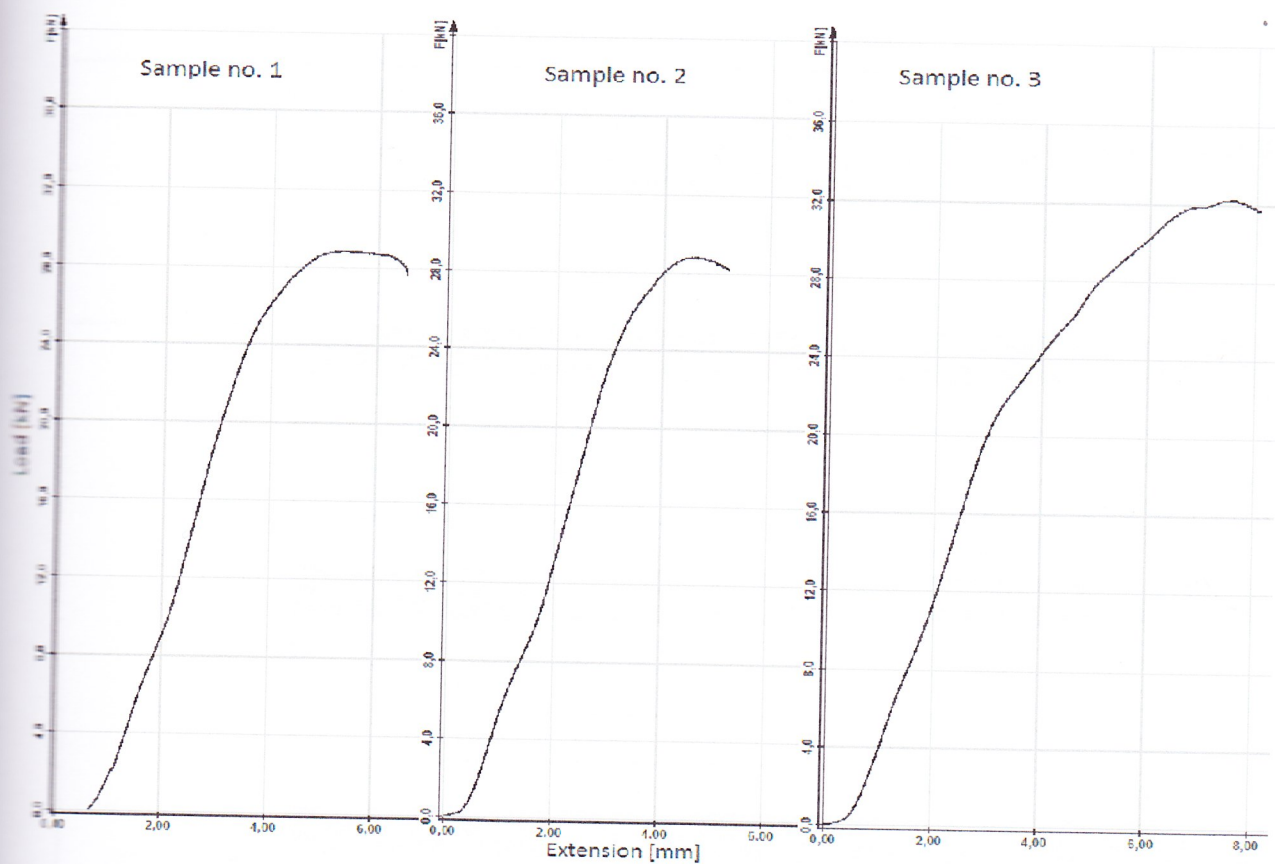


Fig. 10. Compression test of the big (black) wedges – 100% contact surface.

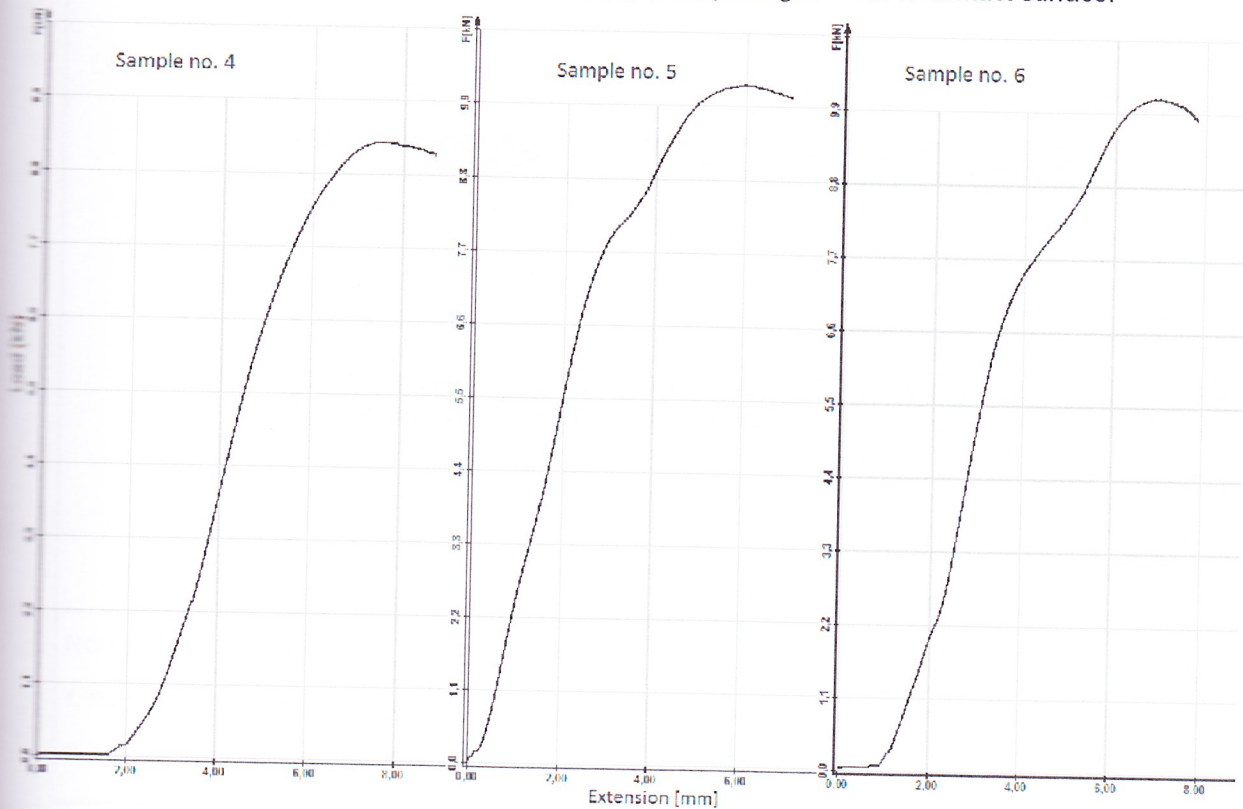


Fig. 11. Compression test of the big (black) wedges – 35% contact surface.

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Table 1. Results of compression tests.

Samples Identification		Mechanical properties – compression strength		
Product	Sample No.	Load	Area	Compression strength
		F	A_c	f_c
		[kN]	[mm ²]	[MPa]
PP glass panels dimensions ~ thickness x width x length 1, 2, 3, 4, 5 x 22 x 95 mm	White glass panels - thickness 1,0 mm			
	2017/23/ 1 ₁	23,76	2145,95	11,1
	2017/23/ 1 ₂	24,68	2129,80	11,6
	2017/23/ 1 ₃	25,41	2142,05	11,9
	Mean value :			11,5
	Blue glass panels - thickness 2,0 mm			
	2017/23/ 2 ₁	21,39	2095,47	10,2
	2017/23/ 2 ₂	21,75	2121,19	10,3
	2017/23/ 2 ₃	22,43	2103,33	10,7
	Mean value :			10,4
	Red glass panels - thickness 3,0 mm			
	2017/23/ 3 ₁	17,78	2119,31	8,4
	2017/23/ 3 ₂	20,80	2117,65	9,8
	2017/23/ 3 ₃	19,12	2123,49	9,0
	Mean value :			9,1
	Yellow glass panels - thickness 4,0 mm			
	2017/23/ 4 ₁	16,55	2710,30	7,7
	2017/23/ 4 ₂	18,05	2712,26	8,5
	2017/23/ 4 ₃	17,72	2712,91	8,4
	Mean value :			8,2
	Green glass panels - thickness 5,0 mm			
	2017/23/ 5 ₁	18,76	2710,30	8,9
	2017/23/ 5 ₂	21,50	2712,26	10,2
	2017/23/ 5 ₃	20,75	2712,91	9,8
Mean value :			9,6	

NOTES:

1. The results are given as the maximum load which the blocks could resist before there was heavy deformation.

2. Pressure speed was approx. 5 mm/min.

NOTES:

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2. Pressure speed was approx. 5 mm/min.

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Table 2. Results of compression tests.

Samples Identification		Mechanical properties – compression strength		
Product	Sample No.	Load	Area	Compression strength
		F	A_c	f_c
		[kN]	[mm ²]	[MPa]
PP wedges dimensions ~ height x width x length	Little (white) wedges 14 x 30 x 90 mm -100% surface contact			
	2017/23/ 1 ₁	8,79	1795,80	4,9
	2017/23/ 1 ₂	8,16	1792,56	4,6
	2017/23/ 1 ₃	7,86	1801,09	4,4
	Mean value :			4,6
	Little (white) wedges 14 x 30 x 90 mm -35% surface contact			
	2017/23/ 1 ₄	3,93	643,30	6,1
	2017/23/ 1 ₅	3,22	645,33	5,0
	2017/23/ 1 ₆	3,60	645,70	5,6
	Mean value :			5,6
	Medium (grey) wedges 15 x 43 x 95 mm -100% surface contact			
	2017/23/ 2 ₁	17,67	2791,92	6,3
	2017/23/ 2 ₂	18,22	2796,14	6,5
	2017/23/ 2 ₃	18,41	2789,93	6,6
	Mean value :			6,5
	Medium (grey) wedges 15 x 43 x 95 mm -35% surface contact			
	2017/23/ 2 ₄	5,68	1013,10	5,6
	2017/23/ 2 ₅	5,42	995,21	5,4
	2017/23/ 2 ₆	6,07	1014,65	6,0
	Mean value :			5,7

NOTES:

1. The results are given as the maximum load which the blocks could resist before there was heavy deformation.

2. Pressure speed was approx. 5 mm/min.

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Table 2 cont. Results of compression tests.

Samples Identification		Mechanical properties – compression strength		
Product	Sample No.	Load	Area	Compression strength
		F	A_c	f_c
		[kN]	[mm ²]	[MPa]
PP wedges dimensions ~ height x width x length	Big (black) wedges 22 x 43 x 150 mm -100% surface contact			
	2017/23/ 3 ₁	20,49	4134,25	5,0
	2017/23/ 3 ₂	21,20	4100,76	5,2
	2017/23/ 3 ₃	22,08	4071,51	5,4
	Mean value :			5,2
	Big (black) wedges 22 x 43 x 150 mm -35% surface contact			
	2017/23/ 3 ₄	6,39	1570,12	4,1
	2017/23/ 3 ₅	7,73	1569,23	4,9
	2017/23/ 3 ₆	7,14	1562,95	4,6
	Mean value :			4,5

NOTES:

1. The results are given as the maximum load which the blocks could resist before there was heavy deformation.

2. Pressure speed was approx. 5 mm/min.

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