

TEST REPORT No. 357438

Place and date of issue: Bellaria-Igea Marina - Italy, 18/12/2018

Customer: BAROS VISION Ltd - Ulitsa Vladaya, 7 - 4000 PLOVDIV - Bulgaria

Date test requested: 22/11/2018

Order number and date: 78595, 23/11/2018

Date sample received: 03/12/2018

Test date: 11/12/2018

Purpose of test: resistance to outward horizontal static loading in accordance with standard NF P01-013:1988 and resistance to dynamic impact with a 50 kg soft body in accordance with standard NF P08-301:1991 of a railing

Test site: Istituto Giordano S.p.A. - Strada Erbosa Uno, 72 - 47043 Gatteo (FC) - Italy

Origin of sample: sampled and supplied by the Customer

Identification of sample received: No. 2018/2857

Sample name*

The test sample is called "RAILING SYSTEM 4500 TOP MOUNTING".

(*) according to that stated by the Customer

Comp. PB
Revis. AB

This test report consist of 8 sheets.

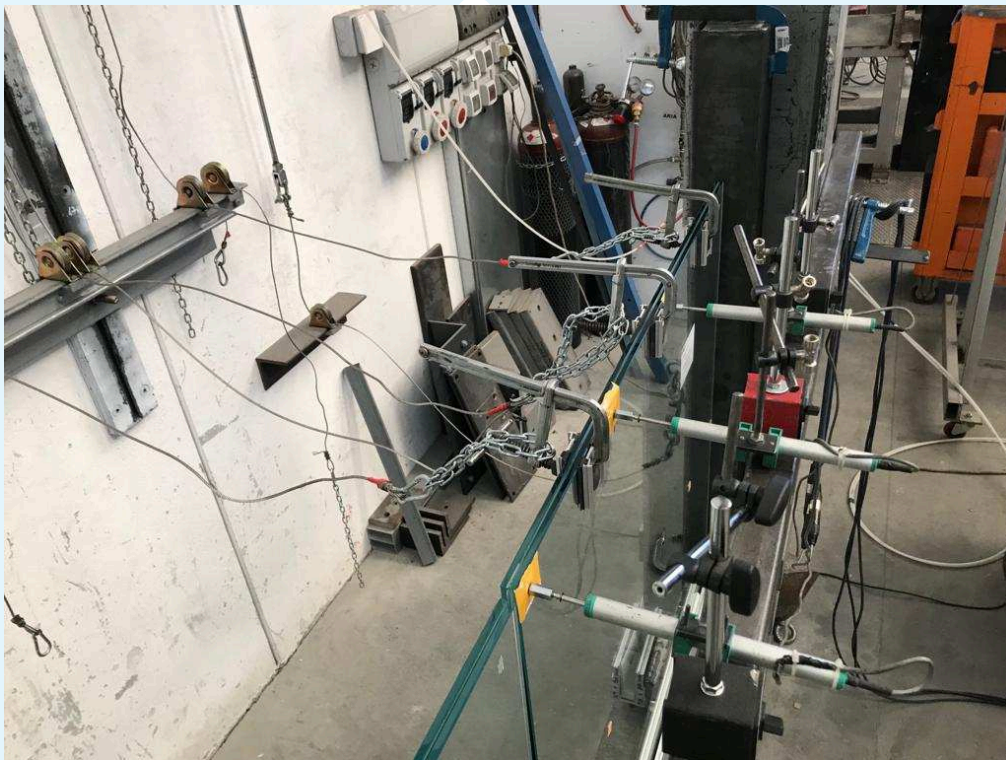
Sheet
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Description of sample*

The test sample consists of a laminated tempered glass railings with aluminium structure, having the following characteristics:

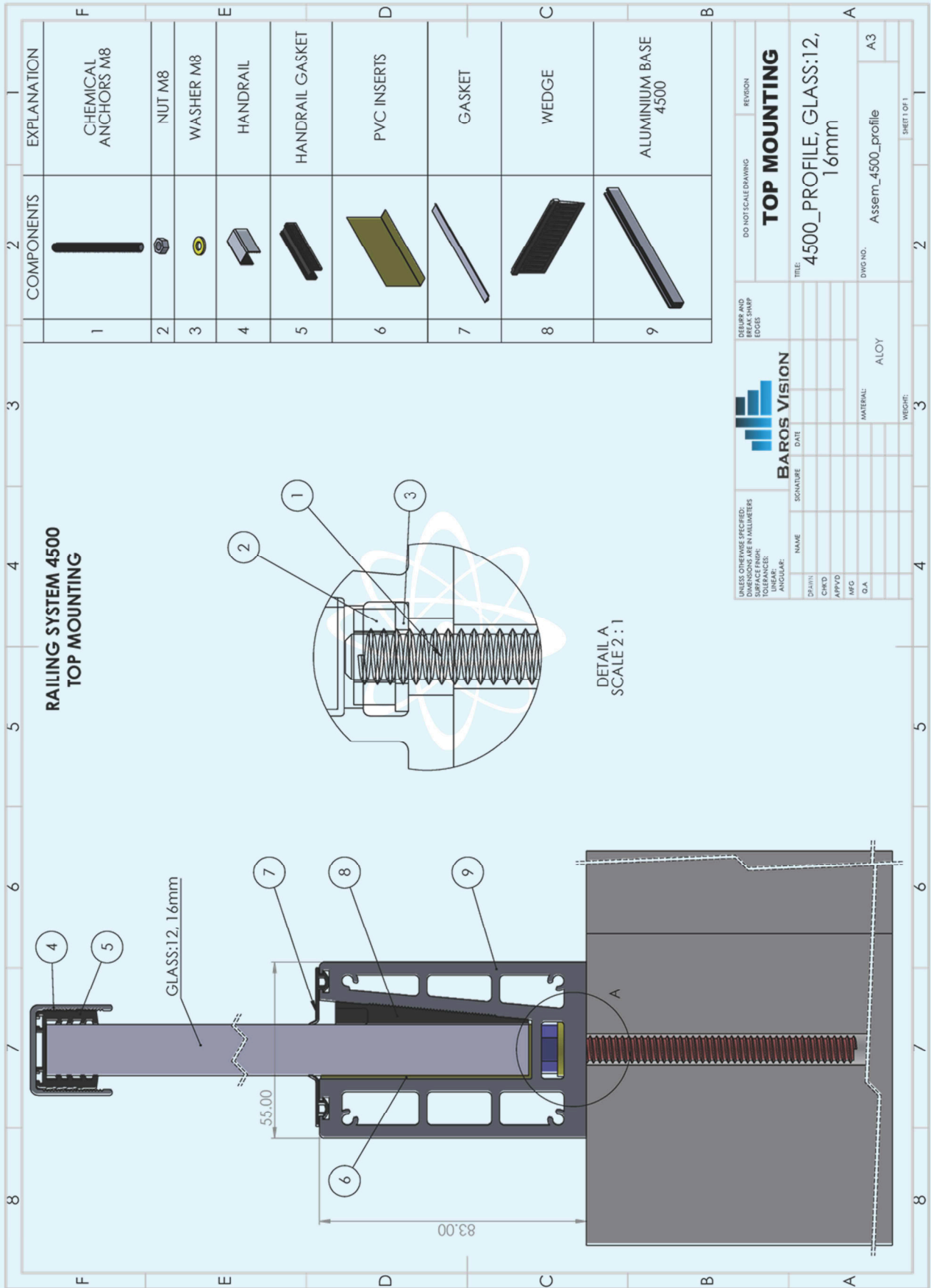
Overall width	1000 mm
Overall height	1020 mm
Glass type	laminated glass 88.2 (tempered + EVA + tempered)
Section of aluminium profile	55 mm × 83 mm

Further details of sample specifications can be seen in Customer-supplied schematic drawings shown in the following sheet.



Photograph of the sample

SAMPLE SCHEMATIC DRAWING SUPPLIED BY THE CUSTOMER



Normative references

The test was carried out in accordance with the requirements of the following standards:

- NF P01-013:1988 dated August 1988 “Essais des garde-corps. Méthodes et critères” (*“Railing tests. Methods and criteria”*);
- NF P08-301:1991 dated April 1991 “Ouvrages verticaux des constructions - Essais de résistance aux chocs - Corps de chocs - Principe et modalités générales des essais de choc” (*“Vertical building elements - Impact resistance tests - Impact bodies - Impact test principle and general methods”*).

Test apparatus

Resistance to outward horizontal static loading (without uprights)

The following equipment was used to carry out the resistance to static loading test:

- steel frame simulating actual installation of the sample on the floor (apparatus in-house identification code: EDI048);
- 3 Gefran electronic displacement transducers model “PZ-34-S150”, range 0 - 150 mm (apparatus in-house identification codes: FT451/1, FT451/2 and FT451/3);
- Mitutoyo IDF Digimatic Indicator complete with calibration report issued by Istituto Giordano S.p.A.;
- AEP Transducers 100 kg load cell (apparatus in-house identification code: EDI107);
- Würth metric ruler model “mEssfix” (apparatus in-house identification code: EDI083);
- La Crosse Technology digital thermo-hygrometer model “WS8009” (apparatus in-house identification code: EDI111).

Resistance to dynamic impact

The test was performed using a sphero-conical bag, diameter 400 mm and height 600 mm, filled with hardened solid glass spheres, diameter 3 mm, until reaching 50 kg overall mass, and suspended by an in-extensible cable of negligible mass so that when hanging at rest it makes contact with the sample at the desired point of impact.

Test method

The sample, secured to the floor, was subjected to the following test.

Resistance to outward horizontal static loading (without uprights)

With just underside secured to the floor, the sample was subjected to a load distributed uniformly over three points on the handrail in accordance with figure 2 “Garde-corps sans potelets, ancrés au niveau de l’appui” (“Railings without posts anchored at the base”) of standard NF P01-013:1988:

- preload of 0,7 kN applied gradually until reaching the present value and maintained for 3 min;
- removal of load and resetting of gauge;
- horizontal static load of 1,3 kN (1 kN/m) applied gradually until reaching the present value and maintained for 60 s, following which deflection whilst loaded was measured;
- removal of load and recording of permanent deflection after 3 min;
- horizontal static safety load of 2,21 kN with coefficient of 1,7 for aluminium, applied and maintained for 5 min, following which deflection whilst loaded was measured;
- removal of safety load and recording of permanent deflection after 3 min and verification of permissible permanent deflection following removal of safety load using the following equation:

$$a \leq \frac{8 \cdot X}{1000}$$

where: a = permissible permanent deflection following removal of safety load in mm.

X = height of sample from fixing point in mm.

Resistance to dynamic impact

With just underside secured to the floor, the sample was subjected to a dynamic load with energy of 600 J (0,50 kN × 1,20 m).

All impacts were made by releasing the impactors so that they fall from a specified height with a pendulum movement and without initial velocity.

The impactors were hung by an inextensible pendulum wire of negligible mass so that when at rest they made contact with the point of intended impact.

After each impact, the impactors were prevented from hitting the sample again after bouncing.

Environmental conditions at the time of testing

Room temperature	(20 ± 2) °C
Relative humidity	(44 ± 5) %

Test results

Resistance to outward horizontal static loading (without uprights)

Applied load [*]	Deflection whilst loaded	Permanent deflection	Maximum permanent deflection ^{**}	Result
[kN]	[mm]	[mm]	[mm]	
1,30	34	0,0	//	//
2,21 ^{***}	65	1,3	8,0	pass

(*) in accordance with clause 2.2.1.2 "Description de l'essai" ("*Description of the test*") of standard NF P01-013:1988.

(**) permissible permanent deflection "a" calculated in accordance with clause 2.2.1.2.4 "Déformation admissible des garde-corps métalliques" ("*Permissible deflection of metal railings*") of standard NF P01-013:1988.

(***) safety load with coefficient of 1,7 for aluminium.

Resistance to dynamic impact

Impact area	Drop height	Energy	Result
	[m]	[J]	
centre of infill	1,2	600	no damage [*]
upper edge of the glass	1,2	600	rupture of glass without falling fragments [*]

(*) No falling fragments that could cause personal injury were found below.

No gaps were formed between the bars of sufficient size to allow the passage of the gauge specified in figure 7 of standard NF P01-013:1988.

No sample performance loss compared to design specifications was witnessed.



Photograph of the sample during resistance to outward horizontal static loading test



Photograph of the sample after impact in the centre of infill

Findings

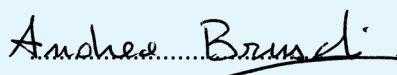
According to the test performed, according to the results obtained and according to what indicated in standard NF P01-013:1988, the test sample, consists of an laminated tempered glass railings with aluminium structure, called "RAILING SYSTEM 4500 TOP MOUNTING" and presented by the company BAROS VISION Ltd - Ulitsa Vladaya, 7 - 4000 PLOVDIV - Bulgaria, is:

Test		Result
Outward horizontal static loading	for use public (1,0 kN/m)	compliant
Dynamic impact with 50 kg soft body		compliant

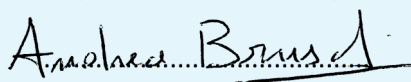
The results given refer exclusively to the test sample itself and are only valid under the same conditions in which testing was carried out.



Test Technician
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Head
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(Dott. Andrea Bruschi)



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(Dott. Arch. Sara Lorenza Giordano)


Firmato digitalmente da SARA LORENZA GIORDANO