



NATIONAL TEST REPORT (BS 6180:2011)

EASY ALU
TOP MONTAGE
MOD.9026
MOD.9027

**Test Report 3057061.
Part 1 of 2**

Q-Railing Europe GmbH & Co.KG

Introduction.

This report has been prepared by Gary Essam and Kevin Huscroft and relates to the activity detailed below:

Job/Registration Details	Client Details
Job number: 3057061 Job type: Testing Start Date: 30/07/2019 Test type: Type Sample ID: N/A Registration: KM 656489 Scheme: BS 6180:2011 Protocol: PP937 Scheme Mgr: Adam Pearce Quality system: ISO 9001:2015	Q-Railing Europe GmbH & Co.KG Marie-Curie-Strasse 8-14 Emmerich am Rhein 46446 Germany

The report has been approved for issue by Chris Rayment – Team Manager

Approved For Issue	
	Issue Date:

Objectives.

Type testing for product certification

Product Scope.

Easy-Alu Top Mounted Balustrade System

Report Summary.

The test samples met the requirements of those clauses of the Specification against which assessments were made

Description of Test Samples.

Sample Description
Aluminium frame with toughened glass infill panel balustrade system – fully and partially glazed (Options A and B respectively)

Test Requirements.

BS 6180:2011 Type testing + Results Tables - Barriers in and about buildings - Code of practice

Clause	Requirements
6	DESIGN CRITERIA
6.3	Loading
6.3.1	General N/As
6.4	Deflection
6.4.1	Barriers for the protection of people N/As
Results Tables	Actual test results <i>See Table A - BS 6180:2011</i>

Summary of Test Comments.

Clause	Comments
6.3.1 & 6.4.1	<p>BS 6180:2011 is a code of practice and the loaded deflections of barrier systems are given as recommendations only.</p> <p>The Structural Use of Glass in Buildings (Second Edition), February 2014, O'Regan, C., The Institution of Structural Engineers states "It must be noted that BS 6180 is a guideline and as such it is ultimately up to the designer to determine acceptable deflection limits on the balustrade under consideration."</p> <p>Further, the tables for summaries for suitability on pages 12 and 13 are given for indication only</p> <p>The testing was supervised at the Emmerich am Rhein, Germany site of Q-Railing on 31 July 2019</p>

Glossary of Terms.

PASS: Complies. Tested by BSI engineers at BSI laboratories.

PASS1: Complies. Witnessed by BSI engineers in manufacturers laboratory.

PASS2: Complies. Tests carried out by third party lab; results accepted by BSI.

PASS*: Report resulted in uncertainty and states that Compliance is more probable than non-compliance.

FAIL: Non compliance – Product does not meet the requirements of this clause.

FAIL*: Report resulted in uncertainty and states that Non-compliance is more probable than compliance.

N/A: Not applicable to design under consideration.

N/As: Not assessed.

N/T: Not tested due to similarity to previously tested item; reference earlier test report.

Conditions of Issue.

This Test Report is issued subject to the conditions stated in current issue of 'BSI Terms of Service'. The results contained herein apply only to the particular sample(s) tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of BSI, who reserve the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

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Supporting Data – Test Results

Table A - BS 6180:2011

Test Results.

CLAUSE

6 DESIGN CRITERIA

6.3 Loading

6.3.1 General

Minimum horizontal imposed loads appropriate to the design of parapets, barriers, balustrades and other elements of structure intended to retain, stop or guide people, should be determined in accordance with Table 2 [of BS 6180:2011], which recommends a uniformly distributed line load for the barrier and a uniformly distributed and point load applied to the infill. These are not additive and should be considered as three separate load cases, all loads being determined according to the type of occupancy which reflects the possible in-service conditions.

Horizontal uniformly distributed line loads should be applied at the design height as presented in Table 1 [of BS 6180:2011] or at the design level 1100mm for barriers higher than the design height.

Uniformly distributed load should be applied at the area below the design height.

Point load should be applied at the most onerous point anywhere on the barrier structure.

6.4 Deflection

6.4.1 Barriers for the protection of people

Barriers for the protection of people should be of adequate strength and stiffness to sustain the applied loads given in Table 2 [of BS 6180:2011]. In addition, a barrier that is structurally safe should not possess sufficient flexibility to alarm building users when subject to normal service conditions. Therefore, for serviceability considerations, the limiting condition for deflection appropriate for a barrier for the protection of people is that the total horizontal displacement of the barrier at any point from its original unloaded position should not exceed the deflection limits determined from the relevant structural design code (where applicable) for the material used, or 25 mm, whichever is the smaller.

Where the infill of a barrier is subjected to imposed loads given in Table 2 [of BS 6180:2011], or if appropriate, other calculated design loads, the displacement of any point of the barrier should not exceed $L/65$ or 25 mm, whichever is the smaller where L is the given in **8.3**, **8.4** or defined in **8.5** [of BS 6180:2011]. A suitable fracture load, factored by a minimum partial safety factor of 4.0 (as recommended in BS 4592-0) should be obtained from the material manufacturer when considering glass barrier design.

Test Results (Continued).

Table 2 Minimum horizontal imposed loads for parapets, barriers and balustrades

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Uniformly distributed load applied to the infill (kN/m²)	A point load applied to part of the infill (kN)
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	0.5	0.25
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	1.0	0.5
Offices and work areas not included elsewhere, including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide	0.22	-	-
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	0.5	0.25
	(v) Areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	1.0	0.5
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.5	1.5	1.5
Areas with tables or fixed seatings	(vii) Restaurants and bars	1.5	1.5	1.5

Test Results (Continued).

Table 2 Minimum horizontal imposed loads for parapets, barriers and balustrades (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Uniformly distributed load applied to the infill (kN/m ²)	A point load applied to part of the infill (kN)
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps	0.74	1.0	0.5
	(ix) External balconies including Juliette balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas	0.74	1.0	0.5
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.5	1.5	1.5
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas.	3.0	1.5	1.5
	(xii) Grandstands and stadia ^{A)}	-	-	-
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops	1.5	1.5	1.5
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges or internal floors, footways, edges of roofs	1.5	1.5	1.5
	(xv) Horizontal loads imposed by vehicles ^{B)}	-	-	-

A) See requirements of the appropriate certifying authority

B) See Annex A

Test Results (Continued).

TEST METHODS

A single section of each type of balustrade system was bolted to a C20/25 concrete block measuring approximately 3200mm x 500mm x 500mm using M8 threaded bars (MOD 4408, Art No 19.4408.110.15 (M8)) in accordance with the manufacturer's instructions. The assembly was, in turn, fixed to the concrete floor of the testing facility.

The ambient temperature in the testing facility was measured at 24.5°C.

Horizontal uniformly distributed line load

The horizontal uniformly distributed line loads were applied to the upper edge of each system through a 0.9m long, rubber faced aluminium bar using a hand-operated pump and cylinder. The forces were measured using a calibrated load cell and display unit.

The deflection measurements of the upper edge of the systems were taken from a fixed datum point at 1100mm from the floor level using a calibrated digital indicator.



Option A



Option B

Typical arrangements for application of horizontal uniformly distributed line loading assembly

Test Results (Continued).

TEST METHODS (Continued)

Uniformly distributed load applied to the infill

The mounting plates of the balustrade system with the largest area of glass (Option A) was bolted to vertical steel girders to enable the glass to be in a horizontal orientation. The uniformly distributed loads were applied to the glass using bags filled with sand. The loads were calculated according to the total glass area.

The deflection measurements at the centre of the glass and at the handrail were taken from fixed datum points using a calibrated digital indicators.



Option A
Typical arrangement for application of uniformly distributed load applied to the barrier system

Test Results (Continued).

TEST METHODS (Continued)

Point load applied to part of the infill

With the balustrade systems mounted as with the horizontally uniformly distributed line load, the point loads were applied to the centre of the glass through a 100mm x 100mm wooden block using a hydraulic cylinder. The loads were measured using a calibrated load cell and display unit. Loads were also applied to points 100mm from an upper corner of the glass and 100mm from the end of the handrail for information.

The deflection measurements on the opposite side of the glass to the loading point were taken from a fixed datum point using a calibrated digital indicator.



Option A

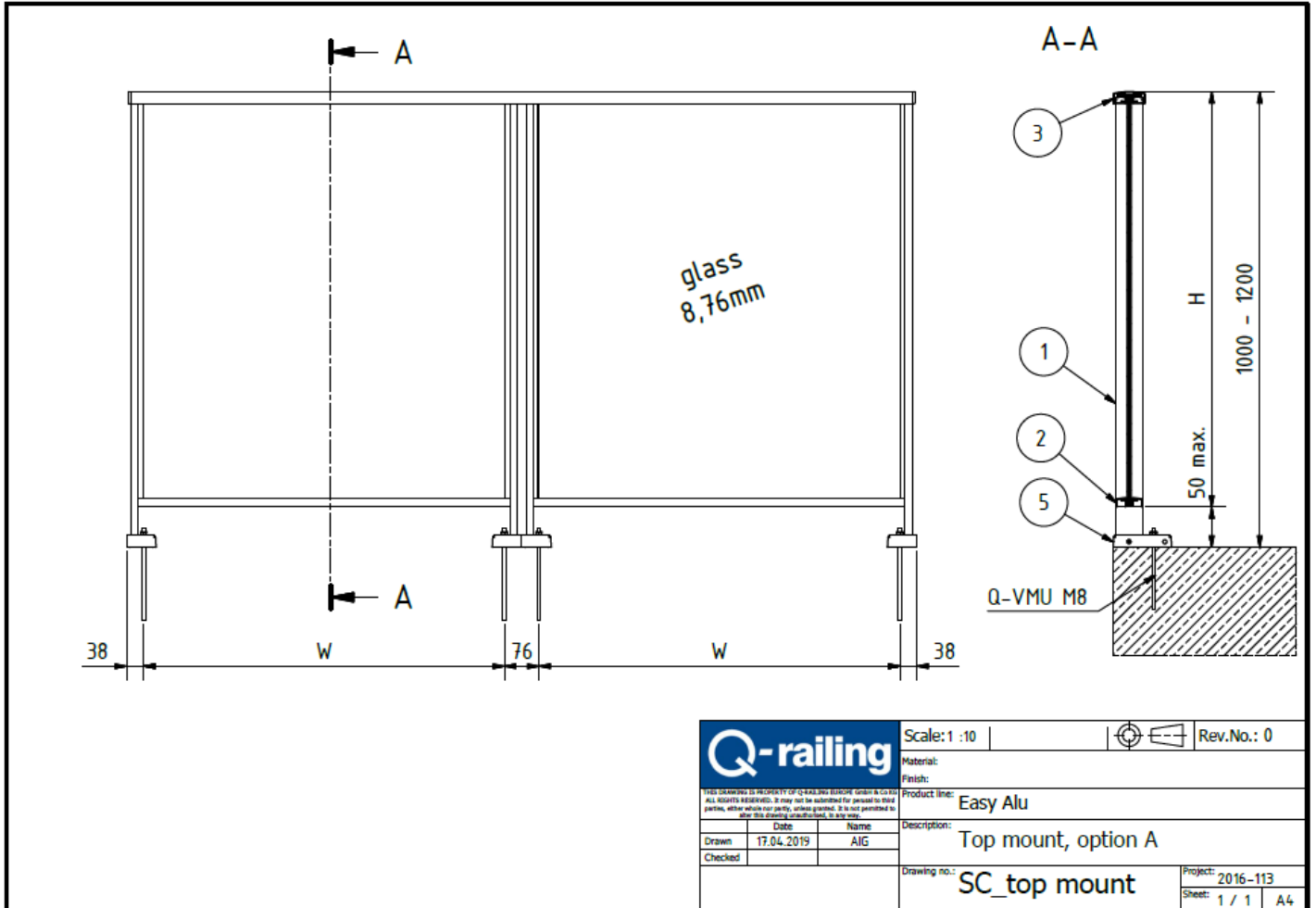


Option B

Typical arrangement for application of point load to the centre of the barrier system

Test Results (Continued).

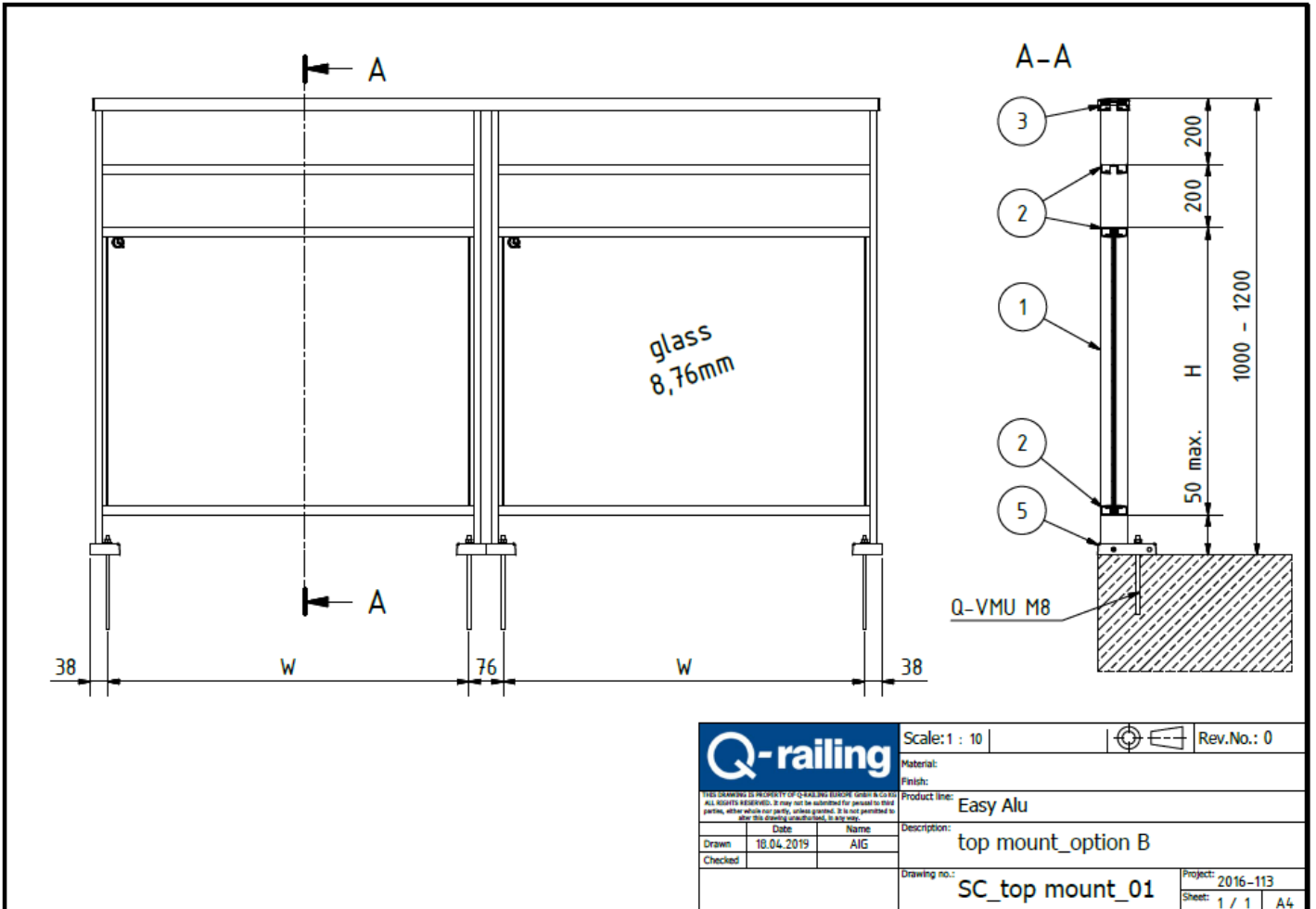
TEST METHODS (Continued)



Easy Alu Top Mount Option A assembly drawing (W = 1100mm)

EXAMINATION AND TEST (CONTINUED)

TEST METHODS (Continued)



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		Material:							
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Easy Alu Top Mount Option B assembly drawing
(W = 1100mm)

Test Results (Continued).

SUMMARY OF TESTING

Easy Alu Top Mounted Balustrade System

Horizontal uniformly distributed line load

Option	Glass size (WxH) (mm x mm)	Glass type	Post distance (mm)	Loading height (mm)	0.36 kN/m line load deflection (mm)	0.74 kN/m line load deflection (mm)	Safety load (1.5 x 0.74 kN/m) (N)	Comments
A	1100 x 1032	4/0.76/4 PVB laminated	1150	1100	13.83	24.40	34.47 ¹⁾	No structural failure
B	1100 x 793	4/0.76/4 PVB laminated	1150	1100	12.04	23.76	34.15 ¹⁾	No structural failure

Note:

1) Recorded for information

Test Results (Continued).

SUMMARY OF TESTING (Continued)

Easy Alu Top Mounted Balustrade System (Continued)

Uniformly distributed load applied to the infill

Option	Glass size (WxH) (mm x mm)	Glass type	1.0 kN/m ² area load deflection (mm)	Safety load (1.5 x 1.0 kN/m) (N)	Comments
A	1100 x 1032	4/0.76/4 PVB laminated	15.69 ¹⁾	- ²⁾	No structural failure

Notes:

1) Maximum deflection recorded after 5 minutes of loading

2) Deflection not recorded

Point load applied to part of the infill

Option	Glass size (WxH) (mm x mm)	Glass type	Position of loading	0.5 kN point load deflection (mm)	Comments
A	1100 x 1032	4/0.76/4 PVB laminated	Centre of glass infill	10.10	No structural failure
			10 cm from top corner of glass	19.49 ¹⁾	No structural failure
B	1100 x 793	4/0.76/4 PVB laminated	Centre of glass infill	6.40	No structural failure
			10 cm from top corner of glass	11.60 ¹⁾	No structural failure
			10 cm from end of centre horizontal member	16.35 ¹⁾	No structural failure

Notes:

1) Recorded for information

Test Results (Continued).

SUMMARY OF SUITABILITY OF BARRIER SYSTEMS

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Option	
			A	B
Domestic and residential activities	(i) All areas within or serving exclusively one single family dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs	0.36	✓	✓
	(ii) Other residential, i.e. houses of multiple occupancy and balconies, including Juliette balconies and edges of roofs in single family dwellings	0.74	✓	✓
Offices and work areas not included elsewhere, including storage areas	(iii) Light access stairs and gangways not more than 600 mm wide	0.22	✓	✓
	(iv) Light pedestrian traffic routes in industrial and storage buildings except designated escape routes	0.36	✓	✓
	(v) Areas not susceptible to overcrowding in office and institutional buildings, also industrial and storage buildings except as given above	0.74	✓	✓
Areas where people might congregate	(vi) Areas having fixed seating within 530 mm of the barrier, balustrade or parapet	1.5	X	X
Areas with tables or fixed seatings	(vii) Restaurants and bars	1.5	X	X

Test Results (Continued).

SUMMARY OF SUITABILITY OF BARRIER SYSTEMS (Continued)

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	Option	
			A	B
Areas without obstacles for moving people and not susceptible to overcrowding	(viii) Stairs, landings, corridors, ramps	0.74	✓	✓
	(ix) External balconies including Juliette balconies and edges of roofs. Footways and pavements within building curtilage adjacent to basement/sunken areas	0.74	✓	✓
Areas susceptible to overcrowding	(x) Footways or pavements less than 3 m wide adjacent to sunken areas	1.5	X	X
	(xi) Theatres, cinemas, discotheques, bars, auditoria, shopping malls, assembly areas, studio. Footways or pavements greater than 3 m wide adjacent to sunken areas.	3.0	X	X
	(xii) Grandstands and stadia ^{A)}	-	-	-
Retail areas	(xiii) All retail areas including public areas of banks/building societies or betting shops	1.5	X	X
Vehicular	(xiv) Pedestrian areas in car parks, including stairs, landings, ramps, edges or internal floors, footways, edges of roofs	1.5	X	X
	(xv) Horizontal loads imposed by vehicles ^{B)}	-	-	-

End of Report



GOOD LUCK WITH
YOUR INSTALLATION!

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IHRER MONTAGE!

SUCCES MET
DE INSTALLATIE!