

# EASY GLASS<sup>®</sup> Smart for Norway

Testing conducted by/at:  
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## 1. Introduction

This report describes tests conducted at the test site of Q-railing Europe GmbH & Co.KG on Easy Glass® Smart from Q-railing's catalogue, assembled as shown in this report.

The test is primarily conducted to check the deflection of the system and not the strength. Only if a security load (ultimate limit state) is mentioned is the strength tested too.

In some countries are static calculations for an approval necessary. This test report don't replace a static calculation. The test results are not transferable. The possible results of these calculations are not considered in the decision which assemblies tested.

The tests were done according to one or more of the following standards:

	Country	Standards
01	Norway	NS-EN-1991-1-1:2002+NA:2008, NS-3510:2015

## 2. Test arrangement

The Easy Glass Smart profiles are mounted with M12 screws on test rig from steel with sufficient strength to withstand loads applied to it.

Anchor and inlay distances are according the catalogue (200 mm anchor distance, 250 mm inlay distance) or mentioned different.

E.G. Smart Y is fixed with an overhang of 70 mm, E.G. Smart F with 15 mm according to the catalogue and indicated in Figure 3. E.G. Smart fascia is mounted without an overhang.

A horizontal line load is applied on different heights, measured from the base of the profile for top & F profiles and from the top of the profile for fascia and Y profiles (see results tables).

The load is generated by a hydraulic cylinder and is measured with a load cell (maximal 2500 kg).

The horizontal displacement is measured with a digital dial indicator in the middle of the glass at the height of the line load.

## 3. Test conditions

Date of testing:	21. – 26.02.2020	(#1 - #13) &
	26. – 28.08.2020	(#14 - #18)
Air temperature:	20 °C	(#1 - #13) &
	18 – 20°C	(#14 - #18)

## 4. Materials

Hardware	Description	Art. number
a. Base shoes:		
E.G. Smart top		16.6930.500.18
E.G. Smart fascia		16.6931.500.18
E.G. Smart F		16.6932.500.18
E.G. Smart Y		16.6933.500.18
b. Rubber sets:		
Q disc system	fix	19.6930.9XX.00
Q disc system	adjustable	19.6931.9XX.00
c. Anchoring:		
M12		

In the following report are the glass panel types named according this list:

ESG	=	toughened glass
TVG	=	heat strength glass (H.S.)
PVB	=	PVB BGR R20
Trosi	=	Trosifol Extra Strong (ES)
Sentry	=	Sentry SG5000

## Glass description

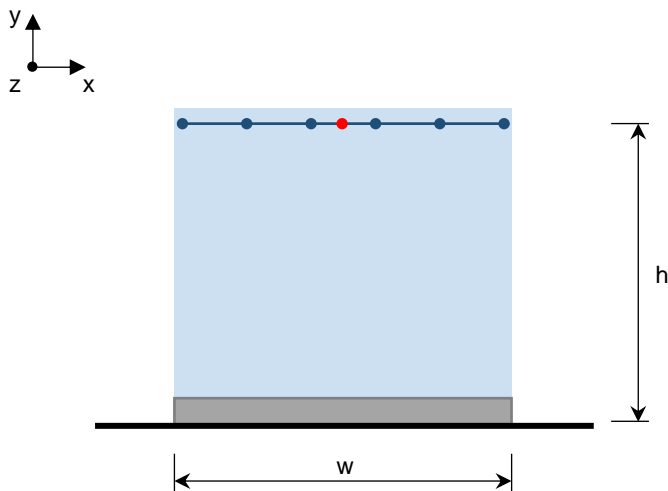
8 mm – 0,76 mm PVB – 8 mm laminated and toughened glass,  
8 mm – 0,76 mm Trosi – 8 mm laminated and toughened glass,  
8 mm – 0,76 mm Sentry – 8 mm laminated and toughened glass,  
8 mm – 1,52 mm PVB – 8 mm laminated and toughened glass,  
10 mm – 1,52 mm PVB – 10 mm laminated and toughened glass,  
10 mm – 1,52 mm Trosi – 10 mm laminated and toughened glass,

For glass dimensions, see results table.

## 5. Arrangement of test assembly

Assembly 1: E.G. Smart top & F

front view:



side view (line load test):

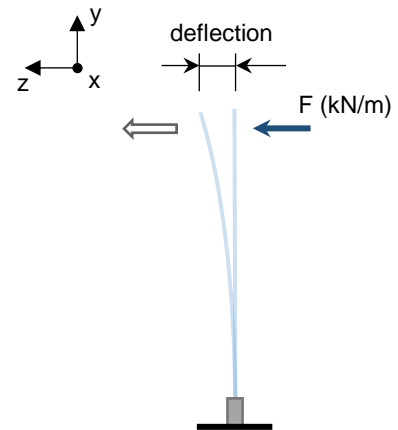
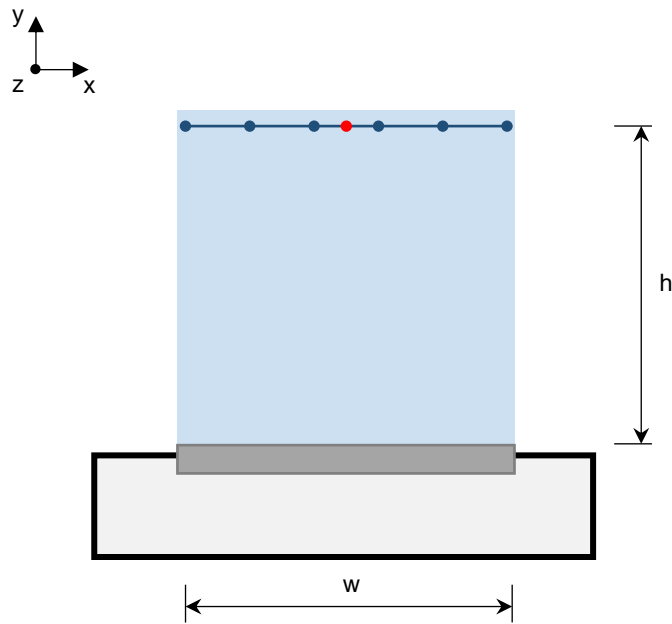


Figure 1: sketch of E.G. Smart top & F static load assemblies

- = position of deflection measurements
- = line load F

Assembly 2: E.G. Smart fascia & Y  
front view:



side view (line load test):

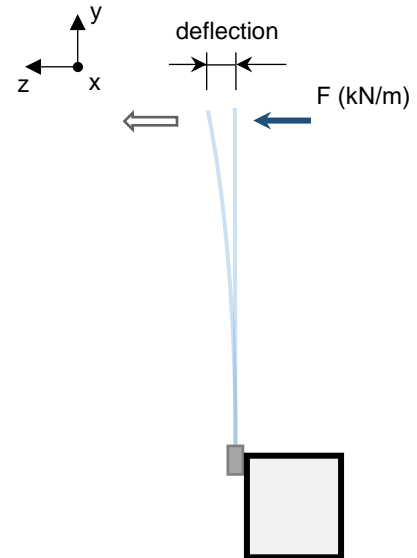


Figure 2: sketch of E.G. Smart fascia & Y static load assemblies



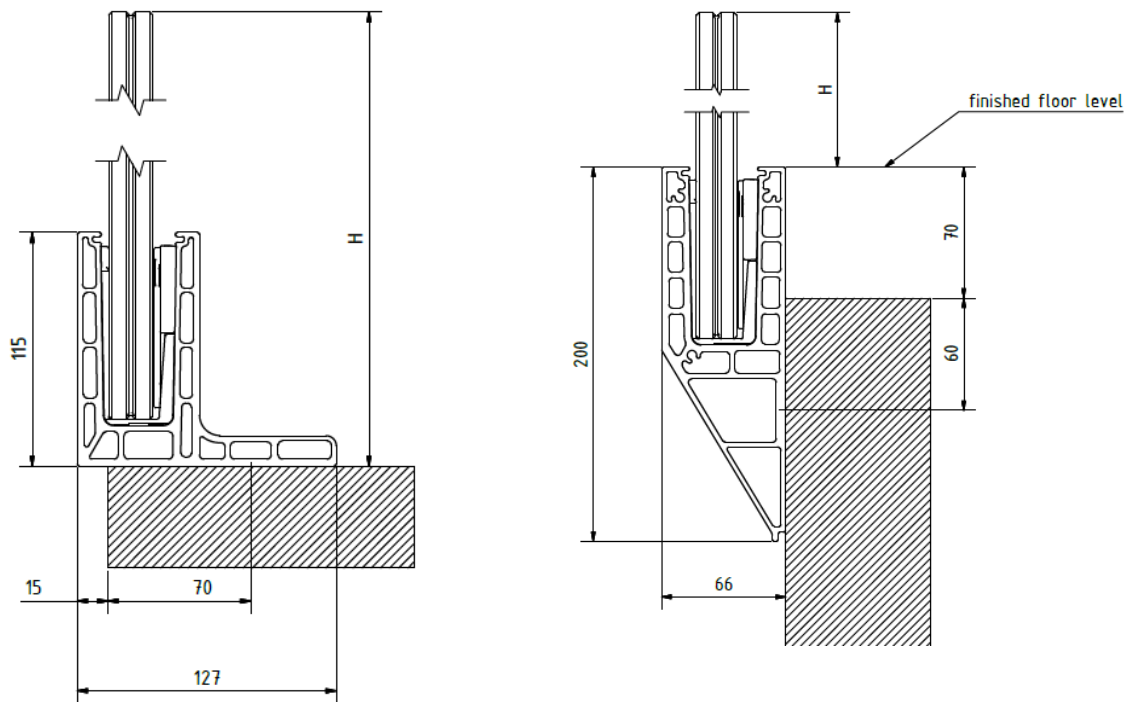


Figure 3: sketches for clarification of the profile positionings on the concrete

For glass description see 4. Materials.  
Tested on steel.

## 6. Test results

Table 1: NO serviceability limit state results

pos.	system	discs	glass			h	defl. at line load	
			thick.	type	dimensions		1,00 kN/m	1,5 kN/m
			mm		mm		mm	mm
P #1	top	adj.	16,76	ESG-PVB-ESG	1000x1300	1200	49,44 <sup>1</sup>	-/-
#14	top	fix	17,52	ESG-PVB-ESG	1000x1300	1000	29,92	54,93 <sup>2</sup>
#16	top	6x fix	17,52	ESG-PVB-ESG	1000x1300	1000	-/-	48,11
#4	top	fix	17,52	ESG-PVB-ESG	1000x1200	1115	46,86	-/-
#8	top	adj.	17,52	ESG-PVB-ESG	1000x1100	1115	45,88	-/-
#15	top	fix	21,52	ESG-PVB-ESG	1000x1100	1115	-/-	44,79
#5	top	fix	21,52	ESG-PVB-ESG	1000x1200	1200	35,50	-/-
P FR #6	fascia	adj.	16,76	ESG-Trosi-ESG	1000x1100	1000	24,84 <sup>1,3</sup>	-/-
#6	fascia	fix	17,52	ESG-PVB-ESG	1000x1100	1000	45,22	-/-
#9	fascia	adj.	17,52	ESG-PVB-ESG	1000x1100	1000	43,52	-/-
#17	fascia	fix	21,52	ESG-PVB-ESG	1000x1100	1000	-/-	44,94
#7	fascia	fix	21,52	ESG-PVB-ESG	1000x1300	1200	45,04	-/-

<sup>1</sup> result of P-2018-01

<sup>2</sup> assembly not according standard (see comments)

<sup>3</sup> derivation from test according French standard

continued Table 1

P FR #1 F	F	adj.	16,76	ESG-PVB-ESG	1000x1100	1115	51,47 <sup>1,3</sup>	-/-
P FR #2 F	F	adj.	16,76	ESG-Sentry-ESG	1000x1100	1115	32,67 <sup>1,3</sup>	-/-
#2	F	fix	17,52	ESG-PVB-ESG	1000x1200	1115	50,53	-/-
P NO-F #1	F	fix	21,52	ESG-PVB-ESG	1000x1200	1215	47,5 <sup>4</sup>	-/-
#11	F	fix	21,52	ESG-PVB-ESG	1000x1300	1315	50,57	-/-
#1	F	fix	21,52	ESG-Trosi-ESG	1000x1300	1315	34,32	-/-
#10	F	fix	21,52	ESG-Trosi-ESG	1000x1300	1215	-/-	41,65
P #1 Y	Y	adj.	16,76	ESG-PVB-ESG	1000x1300	1000	45,94 <sup>1</sup>	-/-
#3	Y	fix	17,52	ESG-PVB-ESG	1000x1100	1000	49,88	-/-
P #2 Y	Y	adj.	16,76	ESG-Trosi-ESG	1000x1800	1200	47,01 <sup>1</sup>	-/-
P NO-Y #2	Y	fix	16,76	ESG-Trosi-ESG	1000x1300	1200	47,8 <sup>4</sup>	-/-
#18	Y	fix	21,52	ESG-PVB-ESG	1000x1100	1000	-/-	46,10
P NO-Y #1	Y	fix	21,52	ESG-PVB-ESG	1000x1300	1200	55,9 <sup>4</sup>	-/-

<sup>4</sup> result of P-2018-05

Table 2: NO ultimate limit state results

pos.	system	discs	glass			h	defl. at line load	
			thick.	type	dimensions		1,35 kN/m	2,0 kN/m
			mm		mm	mm	mm	mm
P #1	top	adj.	16,76	ESG-PVB-ESG	1000x1300	1200	75,83 <sup>1</sup>	-/-
#14	top	fix	17,52	ESG-PVB-ESG	1000x1300	1000	42,35	73,33 <sup>2</sup>
#16	top	6x fix	17,52	ESG-PVB-ESG	1000x1300	1000	-/-	68,39
#4	top	fix	17,52	ESG-PVB-ESG	1000x1200	1115	65,58	-/-
#8	top	adj.	17,52	ESG-PVB-ESG	1000x1100	1115	65,64	-/-
#15	top	fix	21,52	ESG-PVB-ESG	1000x1100	1115	-/-	64,75
#5	top	fix	21,52	ESG-PVB-ESG	1000x1200	1200	50,97	-/-
P FR #6	fascia	adj.	16,76	ESG-Trosi-ESG	1000x1100	1000	37,24 <sup>1,3</sup>	-/-
#6	fascia	fix	17,52	ESG-PVB-ESG	1000x1100	1000	63,83	-/-
#9	fascia	adj.	17,52	ESG-PVB-ESG	1000x1100	1000	62,52	-/-
#17	fascia	fix	21,52	ESG-PVB-ESG	1000x1100	1000	-/-	63,24
#7	fascia	fix	21,52	ESG-PVB-ESG	1000x1300	1200	64,17	-/-
P FR #1 F	F	adj.	16,76	ESG-PVB-ESG	1000x1100	1115	69,15 <sup>1,3</sup>	-/-
P FR #2 F	F	adj.	16,76	ESG-Sentry-ESG	1000x1100	1115	44,15 <sup>1,3</sup>	-/-
#2	F	fix	17,52	ESG-PVB-ESG	1000x1200	1115	71,35	-/-
P NO-F #1	F	fix	21,52	ESG-PVB-ESG	1000x1200	1215	65,6 <sup>4</sup>	-/-
#11	F	fix	21,52	ESG-PVB-ESG	1000x1300	1315	69,93	-/-
#1	F	fix	21,52	ESG-Trosi-ESG	1000x1300	1315	47,71	-/-
#10	F	fix	21,52	ESG-Trosi-ESG	1000x1300	1215	-/-	58,84

continued Table 2

P #1 Y	Y	adj.	16,76	ESG-PVB-ESG	1000x1300	1000	63,33 <sup>1</sup>	-/-
#3	Y	fix	17,52	ESG-PVB-ESG	1000x1100	1000	70,65	-/-
P #2 Y	Y	adj.	16,76	ESG-Trosi-ESG	1000x1800	1200	64,63 <sup>1</sup>	-/-
P NO- Y #2	Y	fix	16,76	ESG-Trosi-ESG	1000x1300	1200	65,4 <sup>4</sup>	-/-
#18	Y	fix	21,52	ESG-PVB-ESG	1000x1100	1000	-/-	66,93
P NO- Y #1	Y	fix	21,52	ESG-PVB-ESG	1000x1300	1200	77,6 <sup>4</sup>	-/-

## 7. Comments

- Mentioned pos. no. (“#”) are for internal allocation
- Standard number of discs (4 discs/m) are used when not mentioned differently.
- Deflections which exceed 100 mm can` t be measured with the dial gauge. If 100 mm are exceeded is the dial gauge removed from the assembly to protect them. A res. defl. measurement isn` t possible afterwards anymore.
- More than in the result tables mentioned tests are not conducted.
- The position of mentioning the different glass types in the tables (column “glass type”) gives the information where the single glass panes are placed in the assembly. The first mentioned glass pane is placed at the inside, the second mentioned is placed at the outside of the railing.
- The deflection of a 16,76 mm glass pane will be theoretical slightly less than with a 17,52 mm glass pane (with same interlayer) by the smaller amount of foils. This is the reason why 17,52 mm glass panes are as far as possible chosen.
- Assemblies with a height of XX15 mm are intended as an embedded profile version.
- Some tested assemblies are not according the standard. They are tested for information.  
Reason for it is that the Norwegian standard NS-3510 prescribes glass type/glass height/load/usage combinations. Please check your wished usage.
- The relevant standards & laws of each country have to be followed.  
Don` t matter what is mentioned in the report.

## 8. Pictures

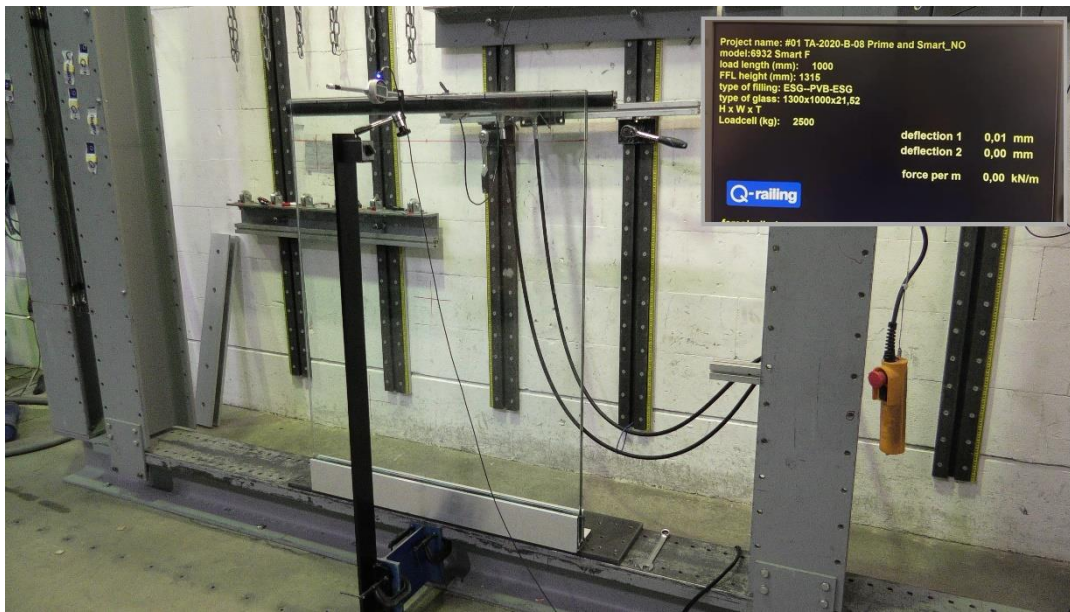


Figure 4: example for general test assembly