



Type approval of safety nets for protection against rockfall

Test Certificate No. S 07-02 ST

System description

• System designation	AXI-050		
• Adresse of manufacturer	GEOBRUGG Fatzer AG Schutzsysteme, Hofstrasse 55, 8590 Romanshorn		
• System description			
– Energy class	500 kJ		
– Posts:	profile	HEB 200	
	quality of steel	S 355	
	length a_l	3.30 m	
	interval a_s	10 m	
– Support ropes:	type	EN 12 385-4 rope class 6x36WS	
	diameter	20 mm	
– Net:	type	Rocco ring net (7 windings)	
	diameter	Ring diameter 350 mm, wire diameter 3 mm	
	mesh	-	
– System drawings			
	Description	No.	Date
	System handbook AXI-050	140-N-FO / EKLS 02	04.01.2007
	Statics	140-N-FO / EKLS 02	28.12.2006
	Drawings	140-N-FO / EKLS 02	28.12.2006

Basic documentation

• Field test (RXI-050)		
WSL test report	Date 30 October 2003	Report No. 03-4
• Statics		
WSL statics test report	Date 22 June 2007	Report No. 07-2
• Overall assessment		
Overall assessment of the EKLS (FECAR)	Date 27 June 2007	Protocol No. 35

Field test – results of tests on 30 October 2003

• Preliminary test of outer part		
– Penetration of test body	yes <input type="checkbox"/>	no <input checked="" type="checkbox"/>
– Additional observations	none	



• Preliminary energy test (50%)	250 kJ
– Height of net h_v	3.06 m
– Penetration of test body	yes <input type="checkbox"/> / no <input checked="" type="checkbox"/>
– Braking time t_s	0.24 s
– Braking distance b_s	4.18 m
– Sum of the tensile forces in the 2 upper ropes	150 kN
– Sum of the tensile forces in the 1 lower rope	104 kN
– Maximum tensile force in one stay rope	50 kN
– List of damaged elements	No damage to the load-bearing parts of the structure. 3 of the 8 braking elements were stretched to almost half of the maximum possible extent.
– Assessment of repairs	The repairs necessary after the test were considered to be normal. The work took 11 person-hours.
• Main energy test (100%)	500 kJ
– Penetration of test body	yes <input type="checkbox"/> / no <input checked="" type="checkbox"/>
– Braking time t_s	0.30 s
– <i>Maximum permissible braking distance b_s</i>	6.0 m
– Measured braking distance b_s	5.07 m
– <i>Minimal permissible residual braking height h_n</i>	1.5 m
– Measured residual braking height h_n	1.82 m
– Sum of the tensile forces in the 2 upper ropes	155 kN
– Sum of the tensile forces in the 1 lower rope	136 kN
– Maximum tensile force in one stay rope	59 kN
– List of damaged elements	No damage to the load-bearing parts of the structure. 6 of the 8 braking elements were stretched to more than half of the maximum possible extent.
• Assessment of special criteria	
– Comments on assembly and on the assembly instructions	The assembly does not present any particular difficulties.
– Comments on adaptability to the terrain	The adaptability to the terrain is normal.



– **Comments on design complexity**

The design is simple. Damaged components are easy to replace.

– **Comments on anticipated service life**

Poles, universal joint and ground plates are unaffected. Support ropes, guy ropes anchoring ropes and the ring net are galvanised according to SIN 2078. The spiral anchor has an additional corrosion protection tube. To increase corrosion protection the manufacturer offers an aluminium-zinc alloy.

The anticipated service life is ascertained to be adequate.

Statics – results of tests on 22 June 2007

• **Maximum forces at head of post**

– force at right angles V_y	66 kN
– normal force N	34 kN
– tangential force V_z	25 kN

• **Static equivalent load at head of post**

– force at right angles V_y	86 kN
– normal force N	44 kN
– tangential force V_z	32 kN

• **Proven cross-sections of posts**

– height of net	3.0 m	3.5 m	4.0 m	4.5 m
– length of post	3.30 m	3.80 m	4.30 m	4.80 m
– profile	HEB 200	HEB 200	HEB 220	HEB 220
– quality of steel	S 355	S 355	S 355	S 355



Overall assessment

Test passed

Test passed with reservations

Tested according to the following guidelines: GERBER, W. 2001: Guideline for the approval of rockfall protection kits. Federal Office for the Environment (FOEN) and Swiss Federal Research Institute for Forest, Snow and Landscape (WSL). Bern, 39 pages, revised June 2006

and

GERBER W., Guidance on the measurement of protection nets with fitted posts, environmental execution. Federal Office for the Environment, Swiss Federal Institute for Research WSL, Bern, draft June 2007

RESERVATION: Should deficiencies arise following certification of the safety net, the FOEN may revoke product release and delete it from the type approval list.

Datum

17.09.07

Name, position

Andreas Götz, Vizedirektor

Signatures

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