



# Type approval of safety nets for protection against rockfall

Test Certificate No. S 03-5

## System description

• <b>System designation</b>	ISOSTOP 1500 kJ		
• <b>Address of designer</b>	isofer ag, Industriequartier, 8934 Knonau, Switzerland		
• <b>System description</b>			
– Energy class		1500 kJ	
– Posts:	profile	HEB 140	
	length $a_l$	4.0 m	
	interval $a_s$	10 m	
– Support ropes:	type	6 x 19 Seale + DIN 3058	
	diameter	22 mm at top, 22 mm at bottom	
– Net:	type	diagonally woven wire net 6 x 7 SE DIN 3055	
	diameter	9 mm, peripheral cable 10 mm	
	mesh	150 x 150 mm	
	height $h_v$	3.66 m	
– System drawings			
	Description	No.	Date
	System of protection against rockfall;	-	21.01.2004
	Energy class 6: 1500 kJ (general documentation)		

## Basic documentation

• <b>Field test</b>			
	WSL test report	Date 14 November 2003	Report no. 03-5
• <b>Overall assessment</b>			
	Overall assessment of the EKLS	Date 27 November 2003	Report no. S 03-5

## Test results

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



<ul style="list-style-type: none"> <li>• <b>Preliminary energy test (50%)</b></li> </ul>	750 kJ
<ul style="list-style-type: none"> <li>– Penetration of test body</li> </ul>	yes <input type="checkbox"/> / no <input checked="" type="checkbox"/>
<ul style="list-style-type: none"> <li>– Braking time <math>t_s</math></li> </ul>	0.28 s
<ul style="list-style-type: none"> <li>– Braking distance <math>b_s</math></li> </ul>	4.20 m
<ul style="list-style-type: none"> <li>– Sum of the tensile forces in the 2 upper cables</li> </ul>	222 kN
<ul style="list-style-type: none"> <li>– Sum of the tensile forces in the 2 lower cables</li> </ul>	180 kN
<ul style="list-style-type: none"> <li>– Maximum of the tensile forces in a stay cable</li> </ul>	54 kN
<ul style="list-style-type: none"> <li>– List of damaged elements</li> </ul> <p>No damage to load-bearing structural members. Twenty-four of the 38 braking elements were deformed and 5 of them were extended to the maximum possible distance.</p>	
<ul style="list-style-type: none"> <li>– Assessment of repairs</li> </ul> <p>24 braking elements were replaced. The time required was 18 man-hours. The extent of repairs necessary following the test is ascertained to be normal.</p>	
<ul style="list-style-type: none"> <li>• <b>Main energy test (100%)</b></li> </ul>	1500 kJ
<ul style="list-style-type: none"> <li>– Penetration of test body</li> </ul>	yes <input type="checkbox"/> / no <input checked="" type="checkbox"/>
<ul style="list-style-type: none"> <li>– Braking time <math>t_s</math></li> </ul>	0.39 s
<ul style="list-style-type: none"> <li>– <i>Maximum permissible braking distance <math>b_s</math></i></li> </ul>	9.0 m
<ul style="list-style-type: none"> <li>– Measured braking distance <math>b_s</math></li> </ul>	5.64 m
<ul style="list-style-type: none"> <li>– <i>Minimum permissible residual braking height <math>h_n</math></i></li> </ul>	2.0 m
<ul style="list-style-type: none"> <li>– Measured residual braking height <math>h_n</math></li> </ul>	2.12 m
<ul style="list-style-type: none"> <li>– Sum of the tensile forces in the 2 upper cables</li> </ul>	240 kN
<ul style="list-style-type: none"> <li>– Sum of the tensile forces in the 2 lower cables</li> </ul>	195 kN
<ul style="list-style-type: none"> <li>– Maximum of the tensile forces in a stay cable</li> </ul>	180 kN
<ul style="list-style-type: none"> <li>– List of damaged elements</li> </ul> <p>The twisted wire net was ruptured over part of the contact area. Thirty-one of the 38 braking elements were deformed and 12 of them were extended to the maximum possible distance.</p>	
<ul style="list-style-type: none"> <li>• <b>Assessment of special criteria</b></li> </ul>	
<ul style="list-style-type: none"> <li>– Comments on assembly and on the assembly instructions</li> </ul> <p>No particular difficulties were encountered with assembly.</p>	
<ul style="list-style-type: none"> <li>– Comments on adaptability to the terrain</li> </ul> <p>Adaptability to the terrain is normal.</p>	
<ul style="list-style-type: none"> <li>– Comments on design complexity</li> </ul> <p>The design is simple. Damaged elements are easy to replace.</p>	
<ul style="list-style-type: none"> <li>– Comments on anticipated life cycle</li> </ul> <p>The steel structure is galvanised (SN EN ISO 1461). The wire cables and cable nets are galvanised according to DIN 2078. The anticipated life cycle is ascertained to be adequate.</p>	



## Overall assessment

Test passed

Test passed with reservations

Examined based on the following guidelines: GERBER, W. 2001: Guideline for the approval of rockfall protection kits. Environment in practice. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Swiss Federal Research Institute WSL. Berne, 39 pages. Revised June 2006.

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

Date

19.05.2006

Name, position

Andreas Götz, Vice Director

Signatures

Replaces the Certificate No. S 05-3 of 16 December 2004

Federal Office for the Environment FOEN  
Risk Prevention Division  
3003 BERN  
[http:// www.umwelt-schweiz.ch/typenpruefung](http://www.umwelt-schweiz.ch/typenpruefung)