

Abstract of test report no. 0208

System TS-2000-oA
Test V0408 / Eisenerz / 03.07.2008

General information

Energy class:	2.000kJ
Manufacturer:	Trumer Schutzbauten GmbH Maria Bühel Strasse 7 A-5110 Oberndorf bei Salzburg
System name:	TS-2000-oA
Test report number:	0208
Report creation date:	17.07.2008

Specification of rock-fall protection kit TS-2000-oA

The tested rock-fall protection kit TS-2000-oA of TRUMER SCHUTZBAUTEN GMBH was a flexible rock-fall protection system for energy impacts up to 2.000kJ. The rock-fall protection kit TS-2000-oA was characterised by a supporting structure which was fixed to the underground by three anchors per ground plate. The posts were connected to the ground plates by welding. The system did not comprise uphill retaining cables. The interception structure of the tested rock-fall protection kit comprised an OMEGA-net. An additional layer was not implemented at the test. The upper and lower longitudinal bearing ropes were arranged as single ropes and connected to the side foundations using energy dissipating devices. The system was supported by two integrated longitudinal ropes, which were connected to the side foundations using two energy dissipating device per connection.

Main components of rock-fall protection kit TS-2000-oA

Interception structure

PRIMARY NET

Type:	OMEGA/9,0mm/MW185
Number of net packages:	6
Dimensions of single net package:	4,15m x 5,00m
Connection to bearing ropes:	threaded
Connection to side posts:	rope: 12 6x19 S – IWRC 1770 B sZ (cp. DIN/EN 12385-4)
Connection between net packages:	by 7/16 inch shackles (26 per face)

The system was tested without additional layer.

Support structure

POSTS WITH WELDED TOP- AND GROUNDPLATE

Type:	I-Profil DIN 1025 – IPB 280 – S235JRG2 (HE 280 B nach EURONORM 53-62)
Material:	S235JRG2
Surface conditioning:	blank
Length:	4.235, reinforced with steel elements

GROUNDPLATE

Material:	S235JRG2
Dimensions:	1155mmx345mmx40mm
Dimensions of shims:	100mmx100mmx10mm
Drill diameter of shims:	42mm
Surface conditioning:	blank
Connection to ground:	by three anchors

The posts are connected to the ground plates by welding.

Connecting components

BEARING ROPES

Upper bearing rope:	24 6x36 WS – IWRC 1770 B sZ	(cp. DIN EN 12385-4)
Lower bearing rope:	24 6x36 WS – IWRC 1770 B sZ	(cp. DIN EN 12385-4)

SUPPORTING ROPES

Upper supporting rope:	24 6x36 WS – IWRC 1770 B sZ	(cp. DIN EN 12385-4)
Lower supporting rope:	24 6x36 WS – IWRC 1770 B sZ	(cp. DIN EN 12385-4)

SIDE CABLES

Side cables:	16 6x19 S – IWRC 1770 B sZ	(cp. DIN EN 12385-4)
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Energy dissipating devices

ENERGY DISSIPATING DEVICES IN BEARING ROPES

Type:	AVT phx/FLA30x80/3,5W
Material:	St 37-2 (S235JR), blank
Diameter:	200 mm
Position:	at the right and left foundations
Connection to rope:	1 inch shackle
Connection to anchor:	1 inch shackle
Number/Surface conditioning:	1 element per connection/blank

ENERGY DISSIPATING DEVICES IN SUPPORTING ROPES

Type:	AVT phx/FLA30x60/4,5W
Material:	St 37-2 (S235JR), zinc coated
Diameter:	200 mm
Position:	at the right and left foundations
Connection to rope:	7/8 inch shackle
Connection to anchor:	7/8 inch shackle
Number/Surface conditioning:	2 elements per connection/blank

Summary of test results System TS-2000-oA

The tested rock-fall protection kit TS-2000-oA of TRUMER SCHUTZBAUTEN GMBH was hit by a block of reinforced concrete with a mass of 7.136kg and a velocity of 25,34m/s. The impact was placed in a height of 1,369m. The angle of block trajectory was determined with 29,52°. The impact energy was determined with 2.290kJ. The maximum horizontal system elongation was 7,104m. The block was stopped within 0,38s and caught by the rock-fall protection kit and did not touch the ground during the test until the system reached the maximum elongation. The whole impact energy was absorbed by the tested rock-fall protection kit. At the guiding devices of the inner posts the energy impact caused damage to the longitudinal bearing and supporting ropes, but the ropes were not broken. In the place of impact the primary net was deformed irreversibly. The energy dissipating devices in the upper longitudinal bearing and supporting ropes were stretched, but still showed about 30-40% of their deformation capacity remaining after the test. The energy dissipating devices in the lower longitudinal bearing and supporting ropes were stretched almost to their deformation limits. As a consequence of the impact the left inner post was slightly buckled and the nominal height of the rock-fall protection kit was reduced from 4,030m to 2,439m, which means a residual height of the tested system of 60,51% of its nominal height.

Affirmation of test report no. 0208

The chair of Mining Engineering and Mineral Economics at the University of Leoben confirms that test report no. 0208 about the testing of rock-fall protection kit TS-2000-oA is correct in respect of content and matter of fact.

The rock-fall protection kit TS-2000-oA of Trumer Schutzbauten GmbH was tested according to the future "Guideline For European Technical Approval of Falling Rock Protection Kits" and **has passed the Maximum Energy Level (MEL) test.**

According to the test criterion "residual height" the system is classified as **System of Category A** (residual height > 50% nominal height).

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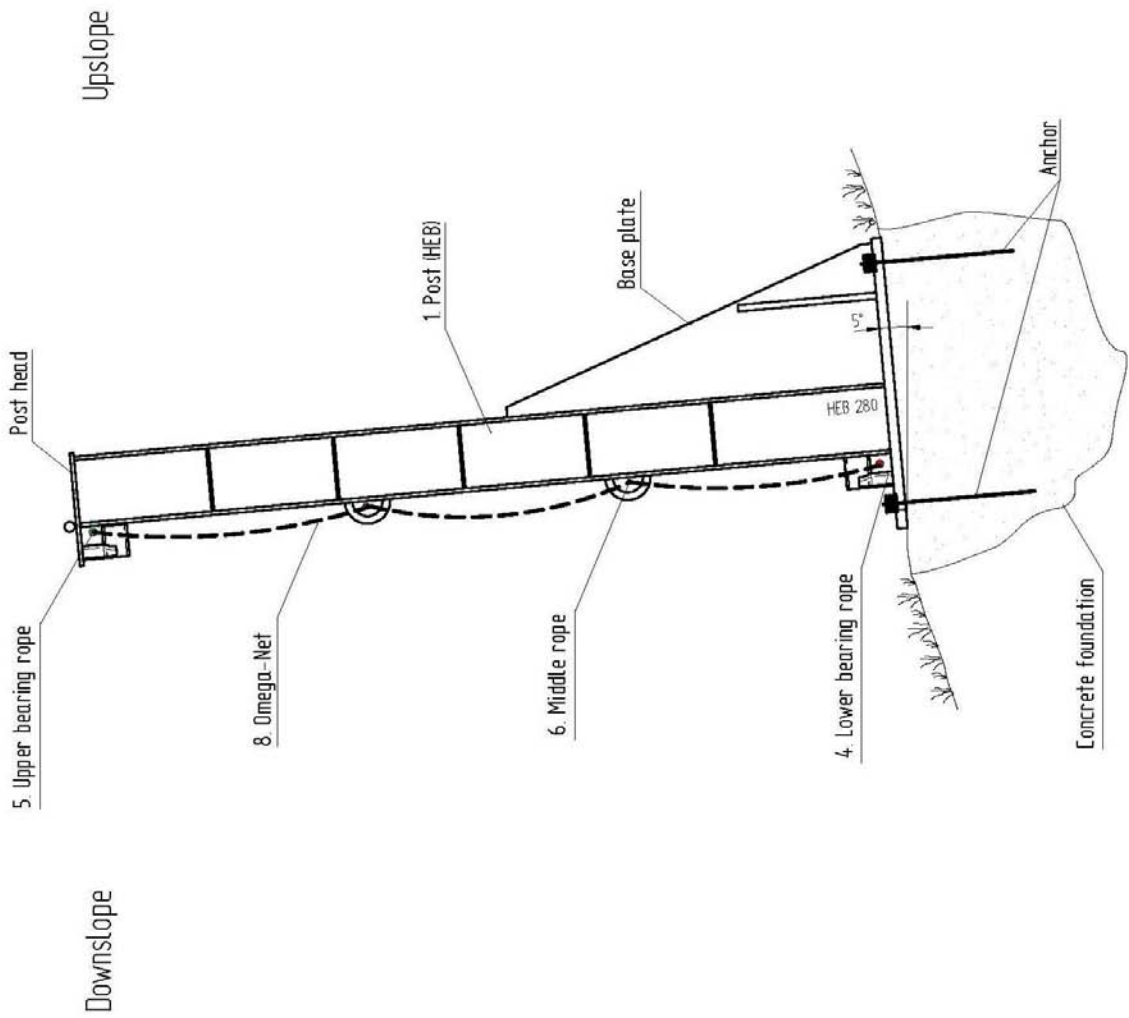
04/09/2009

(Dipl.-Ing. Christian Heiss)



(Univ.-Prof. Dipl.-Ing. Dr.mont. Peter Moser)

Rockfall Protection System TS-2000-oA · Lateral View



- Tested with 2290 kJ

- Rigid base plate

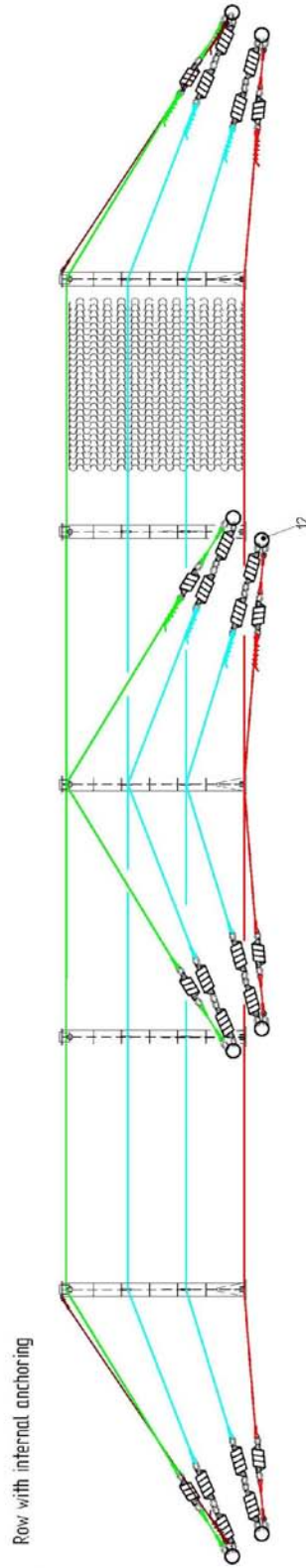
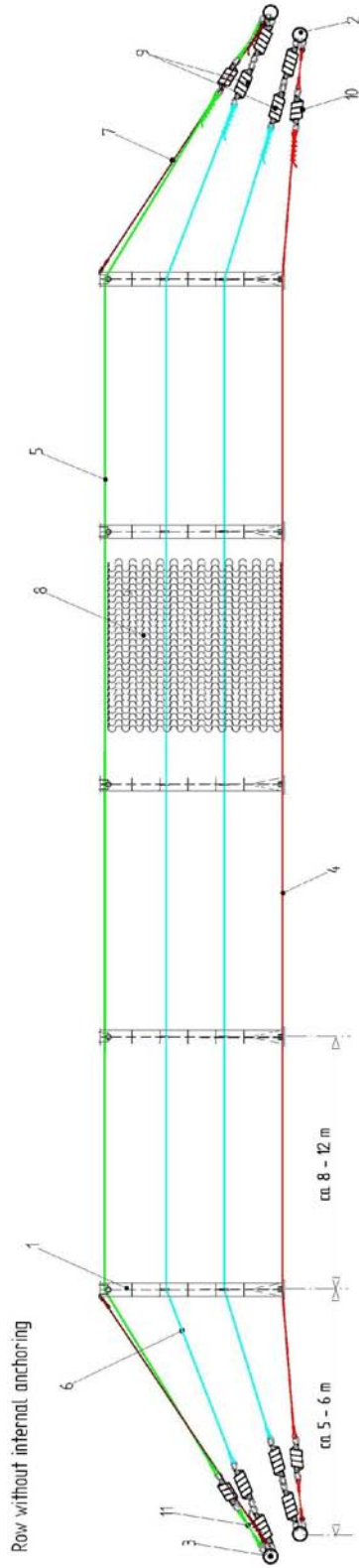
- No upslope retaining ropes

- Bearing and middle ropes

- Brake elements on bearing and middle ropes

- Omega-Net

Rockfall Protection System TS-2000-oA - Frontal View



Legend

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|--|---|
| 1. Post | 7. Side stabilisation rope |
| 2. Lateral anchor for lower bearing and lower middle ropes | 8. Omega-Net |
| 3. Lateral anchor for upper bearing, upper middle and side stabilisation ropes | 9. Brake element AVT ptx. 60/20-4.5 12 pier rope end! |
| 4. Lower bearing rope (along ground) | 10. Brake element AVT ptx. 80/30-3.5 |
| 5. Upper bearing rope (at post head) | 11. Extension rope |
| 6. Middle rope | 12. Internal lateral anchor |