

## Abstract of test report no. 0308

System TS-5000-ZD  
Test V0808 / Eisenerz / 18.09.2008

### General information

Energy class:	5.000kJ
Manufacturer:	Trumer Schutzbauten GmbH Maria Bühel Strasse 7 A-5110 Oberndorf bei Salzburg
System name:	TS-5000-ZD
Test report number:	0308
Report creation date:	10/07/2008

### Specification of rock-fall protection kit TS-5000-ZD

The tested rock-fall protection kit TS-5000-ZD of TRUMER SCHUTZBAUTEN GMBH was a flexible rock-fall protection system for energy impacts up to 5.000kJ. The rock-fall protection kit TS-5000-ZD was characterised by ground plates which were fixed to the underground by two anchors per plate. The posts were connected to the ground plates by tumbler bearings and they were held in position by four uphill retaining cables at their tops. 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 double ropes and connected to the side foundations using one energy dissipating device per rope. Energy dissipating elements were also installed in the uphill retaining cables. The system was supported by four 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-5000-ZD

#### Interception structure

##### PRIMARY NET

Type:	OMEGA/10,5mm/MW180
Number of net packages:	6
Dimensions of single net package:	6,35m x 5,00m
Connection to bearing ropes:	threaded
Connection to side posts:	rope: 16 6x19 S –IWRC 1770 B sZ (cp. DIN/EN 12385-4)
Connection between net packages:	by 1/2 inch shackles (38 per face)

The system was tested without additional layer.

#### Support structure

##### POSTS WITH WELDED TOPPLATE

Type:	I-Profil DIN 1025 – IPB 400 – S235JRG2 (HE 400 B according to EURONORM 53-62)
Material:	S235JRG2
Surface conditioning:	blank
Length:	6.140mm

##### GROUNDPLATE

Material:	S235JRG2
Dimensions:	790mmx350mmx25mm
Dimensions of shims:	100mmx100mmx10mm
Drill diameter of shims:	42mm
Surface conditioning:	blank
Joint pin:	Rd 40 EN10025-S355J2G3 (Length: 150mm)

The posts are connected to the ground plates by tumbler bearings.

#### Connecting components

##### BEARING ROPES

Upper bearing ropes:	24 6x36 WS –IWRC 1770 B sZ	(cp. DIN/EN 12385-4)	(x2)
Lower bearing ropes:	24 6x36 WS –IWRC 1770 B sZ	(cp. DIN/EN 12385-4)	(x2)

SUPPORTING ROPES

Supporting ropes:	24 6x36 WS –IWRC 1770 B sZ	(cp. DIN/EN 12385-4)	(x4)
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RETAINING AND SIDE ROPES

Side cables:	24 6x36 WS –IWRC 1770 B sZ	(cp. DIN/EN 12385-4)	
Uphill retaining cables:	24 6x36 WS –IWRC 1770 B sZ	(cp. DIN/EN 12385-4)	(4 cables per post)

**Energy dissipating devices**

ENERGY DISSIPATING DEVICES IN BEARING ROPES

Type:	AVT phx/FLA30x80/3,5W
Material:	St 37-2 (S235JR)
Diameter:	250 mm
Position:	at the right and left foundations
Connection to rope:	1 inch shackle
Connection to anchor:	1 inch shackle
Number:	1 element per end of rope
Surface conditioning:	blank

ENERGY DISSIPATING DEVICES IN SUPPORTING ROPES

Type:	AVT phx/FLA30x80/4,5W
Material:	St 37-2 (S235JR)
Diameter:	250 mm
Position:	at the right and left foundations
Connection to rope:	1 inch shackle
Connection to anchor:	1 inch shackle
Number:	2 elements per end of rope
Surface conditioning:	blank

ENERGY DISSIPATING DEVICES IN RETAINING ROPES

Type:	AVT phx/FLA30x80/2,5W
Material:	St 37-2 (S235JR)
Diameter:	250 mm
Position:	at the retaining foundations
Connection to rope:	1 inch shackle
Connection to anchor:	1 inch shackle
Number:	1 element per end of rope
Surface conditioning:	blank

Summary of test results System TS-5000-ZD

The tested rock-fall protection kit TS-5000-ZD of TRUMER SCHUTZBAUTEN GMBH was hit by a block of reinforced concrete with a mass of 13.531kg and a velocity of 28,03m/s. The impact was placed in a height of 3,518m. The angle of block trajectory was determined with 22,99°. The impact energy was determined with 5,315kJ. The maximum horizontal system elongation was 9,954m. The stopping time was 0,495s and the stopping distance was 7,70m in horizontal direction and 4,09m in vertical direction. The block was stopped 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.

The energy impact caused an irreversible deformation of the interception structure in the place of the impact. The surface of a few wires of the bearing and supporting ropes were damaged at the guiding devices of the inner posts. The joint pins of the tumbler bearings and the top-plates of the posts were slightly deformed after the test. The energy dissipating devices in the longitudinal bearing ropes and supporting ropes were stretched but still had about 50% of their deformation capacity after energy impact. The energy dissipating devices of the retaining cables were stretched to their limits just in the centre module of the system. As a consequence of the impact the nominal height of the rock-fall protection kit was reduced from 6,128m to 3,992m, which means a residual height of the tested system of 65,15% of its nominal height.

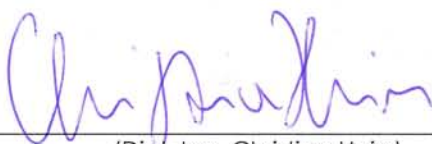
Affirmation of test report no. 0308

The chair of Mining Engineering and Mineral Economics at the University of Leoben confirms that test report no. 0308 about the testing of rock-fall protection kit TS-5000-ZD is correct in respect of content and matter of fact.

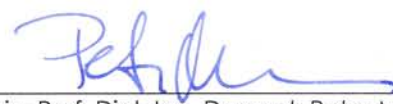
**The rock-fall protection kit TS-5000-ZD of Trumer Schutzbauten GmbH** was tested according to the "Guideline For European Technical Approval of Falling Rock Protection Kits" and **has passed the Maximum Energy Level (MEL) test.**

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

Leoben, 2008/10/23

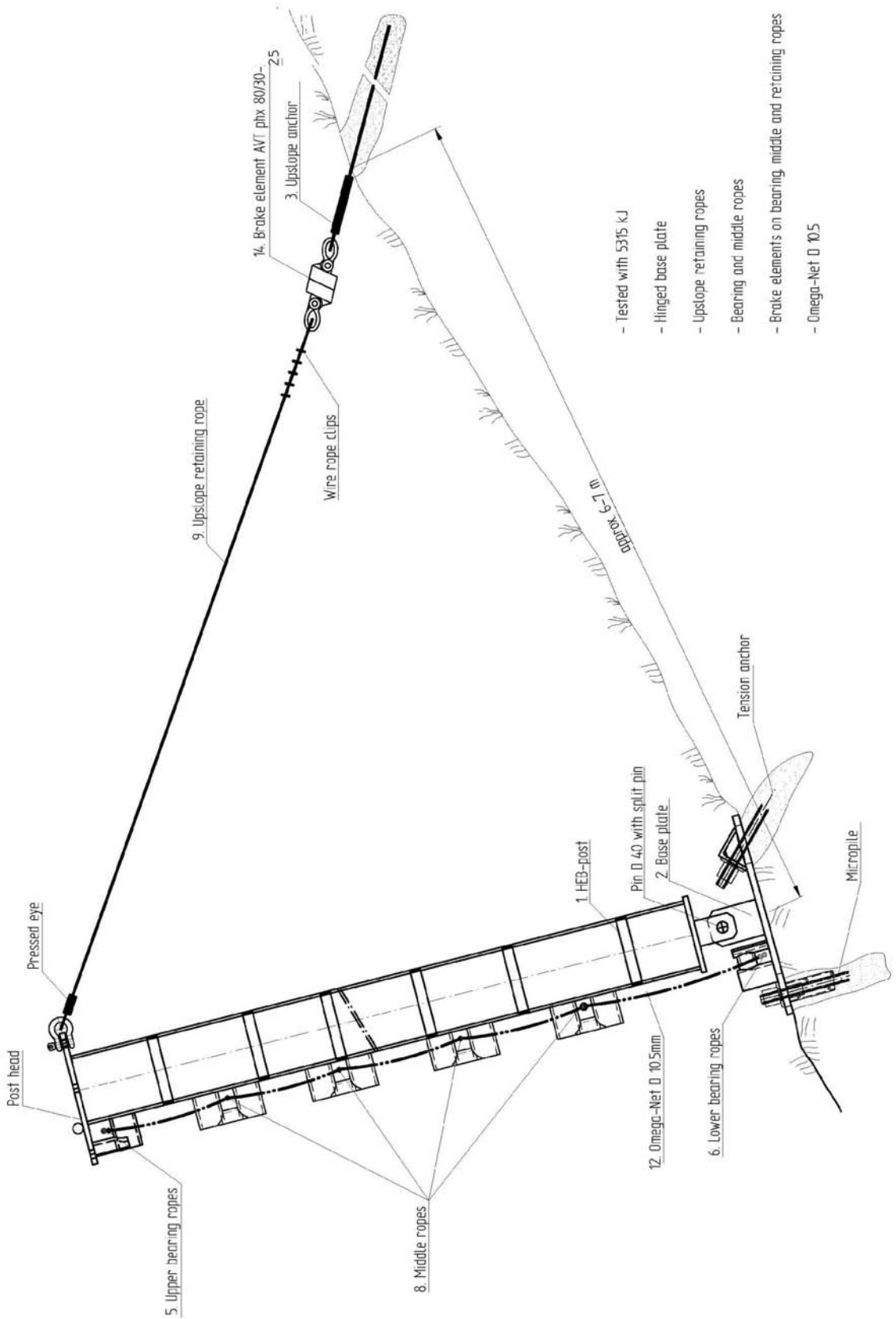


(Dipl.-Ing. Christian Heiss)

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

# Rockfall Protection System TS-5000 - Lateral View



# Rockfall Protection System TS-5000 - Plan View

