Measuring Anchors

The objectives of using short anchors in tunnelling to secure rock can be summarised in accordance with MÜLLER and FECKER (1978) as follows:

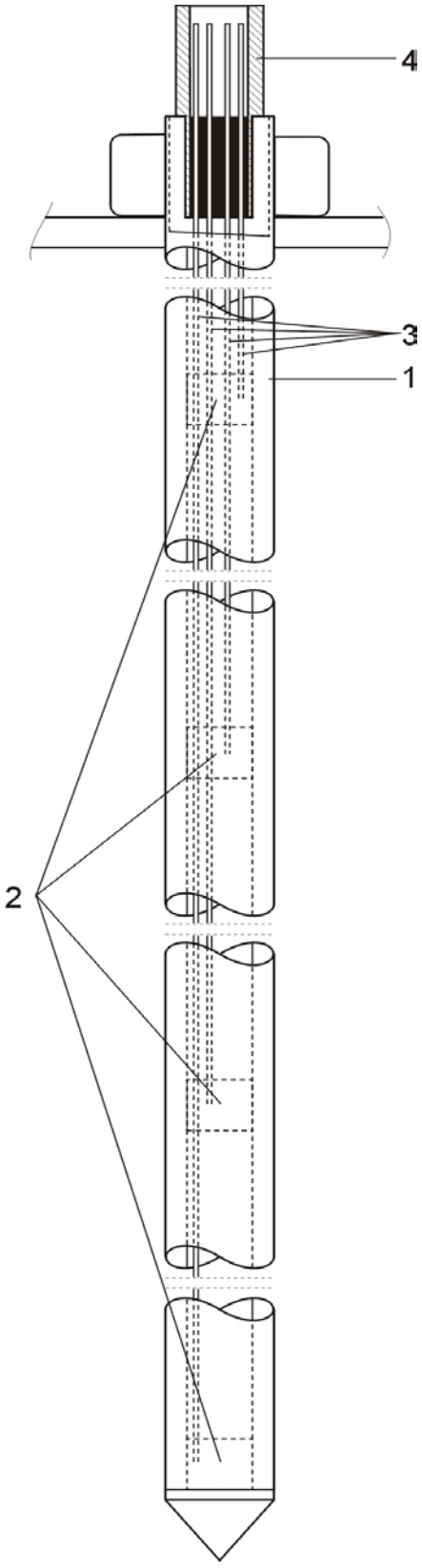
- Fastening of gradually loosening blocks
- Fixing of plates to the tunnel roof
- Prevention of loosening
- Creation of a three-dimensional state of stress at the edge of the excavation
- Creation of a rock-steel vault ("reinforced rock")

Only in clear-cut cases is it possible to venture a forecast - based on experience and judgement - on how effective and suitable an anchor will prove to be. It is particularly difficult to assess an anchor's long-term behaviour, which in some types of rock is impaired by creeping of the anchor foot (on the rock side). Even if the risk of creeping is disregarded, it is still difficult to assess how strong a bond can be achieved. Hence apart from when rock conditions are quite unmistakable, you are strongly advised to conduct basic suitability tests for each case of application in order to establish the likely load capacity, life, creep dimensions and relaxation.

One way to perform a suitability test of this kind is with a measuring anchor. This is a combination of anchor and multiple-point extensometer. It is designed as a hollow anchor, inside of which the various rods of the extensometer are fastened at different depths. Given the anchor's strain at various depths and the modulus of elasticity of the anchor steel it is possible to calculate the stress or relaxation at different depths, always remembering that bending etc. can corrupt the results. The second derivative of the deformation curve plotted as a function of depth reflects the shear transfer between anchor and rock, which can be used to asses the effect of the anchor.

Geotechnisches Ingenieurbüro
Prof. Fecker & Partner GmbH
Am Reutgraben 9 Fon: ++7243/5983-7
D-76275 Ettlingen Fax: ++7243/5983-97

Measuring Anchors



APPLICATION

For all underground cell structures in which a rock bearing ring is formed by systematic anchoring. It is used to determine the depths at which the anchor force is distributed. Hence the measuring anchor can also be used to determine the most suitable anchor lengths.

The following advantages
- Replaces a system anchor
- No special borehole required
- Simple mechanical readout

make the device a non-elaborate yet highly informative instrument for underground work.

DESCRIPTION

The mechanical measuring anchor consists of a hollow anchor rod (1) that corresponds to the respective system anchor type in its sectional area and material. Inside this rod it is possible to fasten measuring rods to the anchor rod at any four points. Miniature measuring rods (3) lead from these anchor points (2) to the anchor head (4). With a mechanical dial gauge it is possible to determine the changes of length caused by strains or compressive strains between the various anchor points. It is thus possible to monitor the loading of the anchor rod within the various depth ranges.

TECHNICAL DATA

Overall length: 2 to 6 m, longer in special cases
Individual measuring lengths: 0.5 to 6 m, longer in special cases
Reading accuracy: ± 0.01 mm with a dial gauge
Fitting direction: Any angle inclination between horizontal and vertical is possible. The anchor is embedded in concrete along its full length.
Material: Hollow anchor 26 x 7 mm equivalent to anchor of 22 mm dia. with or without weld ribs; alternatively, hollow anchor 28 x 8 mm equivalent to anchor of 24 mm dia.

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Sales Information

3.2.1	Measuring anchor type MA 25 250 kN, ∅ 28 mm	l = 2 m
3.2.2	dito	l = 3 m
3.2.3	dito	l = 4 m
3.2.4	dito	l = 6 m
3.2.5	dito	l = 9 m

3.2.6 Mechanical readout unit
for manual measurements type GMM 30
consisting of:
- dial gauge 30 mm measuring range
- standard gauge
- protective box

3.2.7 Mechanical readout unit
for manual measurements type GMM 50
consisting of:
- dial gauge 50 mm measuring range
- standard gauge
- protective box

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