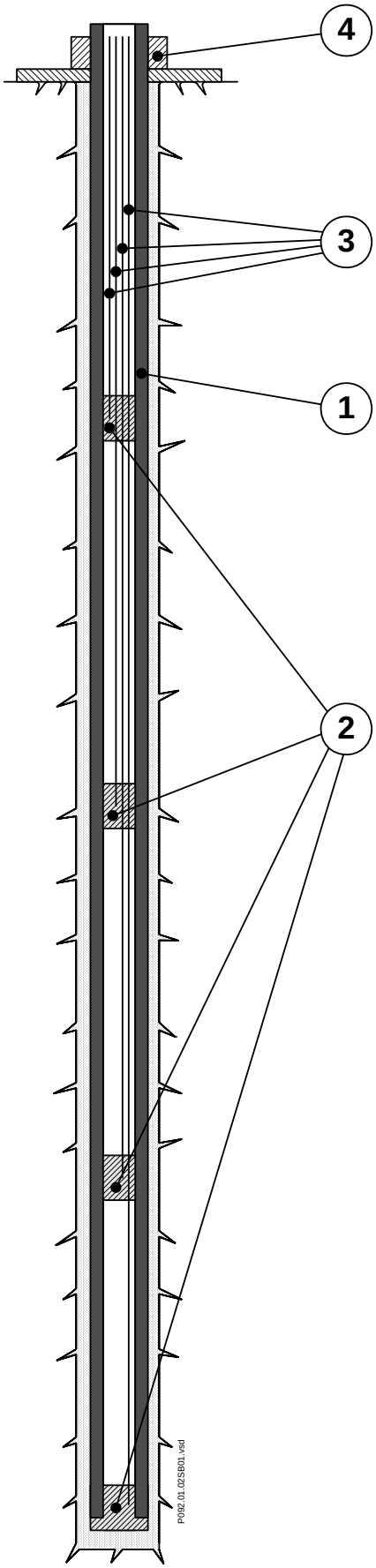
GLÖTZL Baumeßtechnik

MECHANICAL MEASURING ANCHOR

Type: MA 25
Art. No: 92.01.02



Application

For all underground repository constructions for which the formation of a rock supporting ring should be achieved by system anchoring. The measuring anchor is a combination of anchor and extensometer. Is it its task to determine the deepening ranges in which the load discharge is given by the breaking up of the rock. Therefore, the anchor is suitable for determination of the most favourable anchor lengths. By three advantages the instrument is a low-cost, but recommendable device for practice: Firstly the possibility of an installation in each borehole which can also be used for system anchors, secondly the fact that is replaces an anchor and thirdly the simply operatable mechanical reading.

Instrument Description

The mechanical measuring anchor consists of a hollow anchor rod **(1)**, the cross-sectional area and material of which correspond to a 26-mm anchor. Inside of this rod, measuring rods can permanently be connected with the anchor rod at four free-selectable points. From these anchor points **(2)** miniature measuring rods **(3)** are conducting to the anchor head **(4)**. By means of a suitable mechanical dial gauge, longitudinal deformations by elongations between the single anchoring points can be determined. Thus, the stress of the anchor rod can be controlled in the single deepening ranges.

Technical Data

Overall length: maximal 6 m

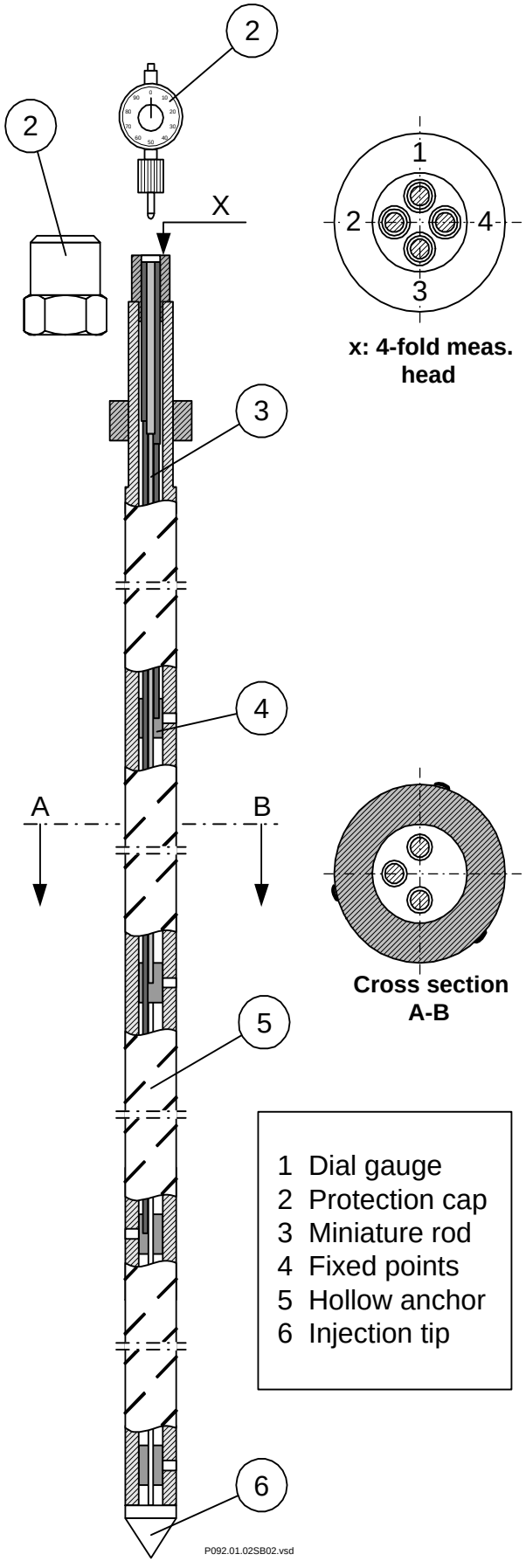
Measuring lengths: Any four lengths up to 6 m

Measuring accuracy: 0.01 mm

Installation direction: Any inclination between horizontal and vertical installation

Reading: Manual reading of dial gauge

Evaluation of Field Measurement
Technical Data



x: 4-fold meas. head

Cross section A-B

1 Dial gauge
2 Protection cap
3 Miniature rod
4 Fixed points
5 Hollow anchor
6 Injection tip

Application

For all underground repository constructions for which the formation of a rock supporting ring should be achieved by system anchoring. The measuring anchor is a combination of anchor and extensometer. It is its task to determine the deepening ranges in which the load discharge is done by the breaking up of the rock. Therefore, the anchor is suitable for determination of the most favourable anchor length.
By the following advantages
- replaces a system anchor
- no special boring necessary
- simple mechanical reading

the instrument is a low-cost, but indicative measuring device for the underground mining.

Instrument Description

The mechanical measuring anchor consists of a hollow anchor rod **(5)**, the cross-sectional area and material of which correspond to the concerned anchor. Inside of this rod, measuring rods can permanently be connected with the anchor rod at any four points. From these anchor points **(4)** miniature measuring rods **(3)** are conducting to the anchor head. By means of a suitable mechanical dial gauge **(1)** longitudinal deformations by elongations or upsettings between the single anchor points can be determined. Thus, the stress of the anchor rod can be controlled in the single deepening ranges.

Technical Data

Overall lengths: 2, 3, 4 or 6 m, in special cases more

Measuring lengths: 0.5 to 6 m, in special cases more

Reading accuracy: 0.01 mm with dial gauge

Installation direction: Any inclination between horizontal and vertical installation is possible. Mortared in complete length.

Model: Hollow anchor with or without welded knobs

Type MA20: Nominal size Ø 26 mm (Ø incl. welded knobs Ø 33 mm) for system anchor 200 kN breaking load

Type MA25: Nominal size Ø 28 mm (Ø incl. welded knobs Ø 35 mm) for system anchor 250 kN breaking load

Further load steps on request

Evaluation of Field Measurement

Definitions

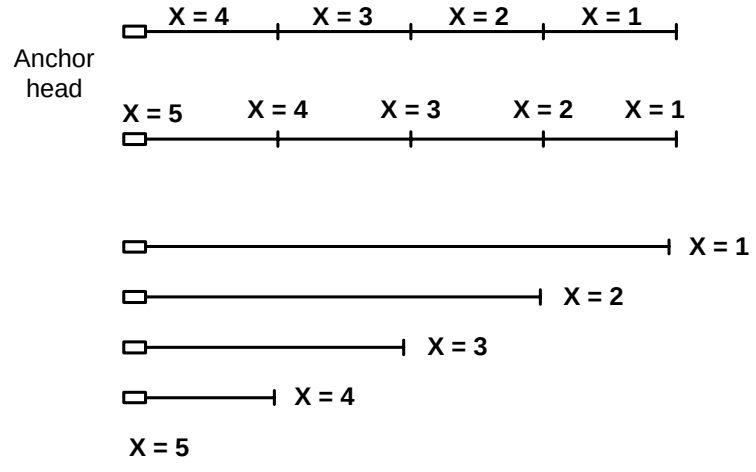
In case of mechanical measuring anchor in standard version, the anchor is subdivided in four measuring sections with the same length. The mean value of the absorbed load in each measuring section is calculated by use of the anchor point displacement determined by means of the mechanical dial gauge.
The parameters and variables indicated on the attached data sheet, protocol and evaluation of field measurements have the following meaning:

X = Index for identification of measuring section,
of the measuring rods and the accompanying fixed point
x = (1, 2, 3, 4)
t = Index for identification of the time of measurement
t = (0, 1, 2, ..., i)
A (x, t) = Reading of dial gauge at measuring rods x at time t, in mm
M (x, t) = A (x, 0) - A (x, t) = Displacement of fixed point x between time and zero measurement (t = 0), in mm
P (x, t) = Mean value of anchor load, recorded by measuring section x at time t, in kN
L (x) = Length of measuring rods, in mm
E = Elasticity module of mechanical measuring anchor in kN/mm^2
F = Cross-sectional area of mechanical measuring anchor in mm^2

$$P(x,t) = E \times F \times \frac{M(x,t) - M(x+1,t)}{L(x) - L(x+1)} = E \times F \times \frac{\Delta M}{\Delta L}$$

By definition is L (5) = M (5, t) = 0
The above mentioned evaluation formula is only valid for the elastic range of the mechanical measuring anchor.

1. Allocation of variable indexes
For simplification of calculation, a combination has been done between the variables of the formula indicated in data sheet No. 5.5, page 1 C and the instrument parts of data sheet No. 5.5, page 1 with the index X. The prevailing meaning can be seen in the sketch.



X	allocated for:
P (x, t)	Anchor load-mean value in measuring cross section X
M (x, t)	Displacement of fixed point X
L (x)	Length of measuring rods X

2. Technica Data

Measuring anchor type	Measuring anchor nominal diameter	Measuring anchor cross section	Measuring anchor E-modulus
MA20	26.0 mm	417.8 mm^2	201.036 kN/mm^2
MA25	28.0 mm	502.6 mm^2	201.036 kN/mm^2

Mechanical Measuring Anchor MP 92.00

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Records and Evaluation of Field Measurements

MP 9201100 Mechanical Meas. Anchor.doc

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Site:	Measuring Cross Section:	Name of Resp. Person:

Station No.:	Anchor No.:	Anchor Length:	Standard Measure:	Anchor Diameter:	Page No.:
		m	25.00 mm	☐ 26.0 mm (MA20) ☐ 28.0 mm (MA25)	

A (X,t) Dial Gauge Reading [mm] __ __ , __ __	M (X,t) Fixed Point Displacement [mm] __ __ , __ __	P (X,t) Anch. Load in Section X [kN] __ __ , __ __

Curr.No.:	Date:	Time:		X = 1	X = 2	X = 3	X = 4
			A (X,t)				
			M (X,t)				
			Δ M				
			P (X,t)				
			A (X,t)				
			M (X,t)				
			Δ M				
			P (X,t)				
			A (X,t)				
			M (X,t)				
			Δ M				
			P (X,t)				
			A (X,t)				
			M (X,t)				
			Δ M				
			P (X,t)				
			A (X,t)				
			M (X,t)				
			Δ M				
			P (X,t)				
			A (X,t)				
			M (X,t)				
			Δ M				
			P (X,t)				

Remarks:

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