

GLÖTZL Baumeßtechnik

MEASURING ANCHORS • CONVERGENCE BOLTS • SURVEYING POINTS • EXTENSOMETERS

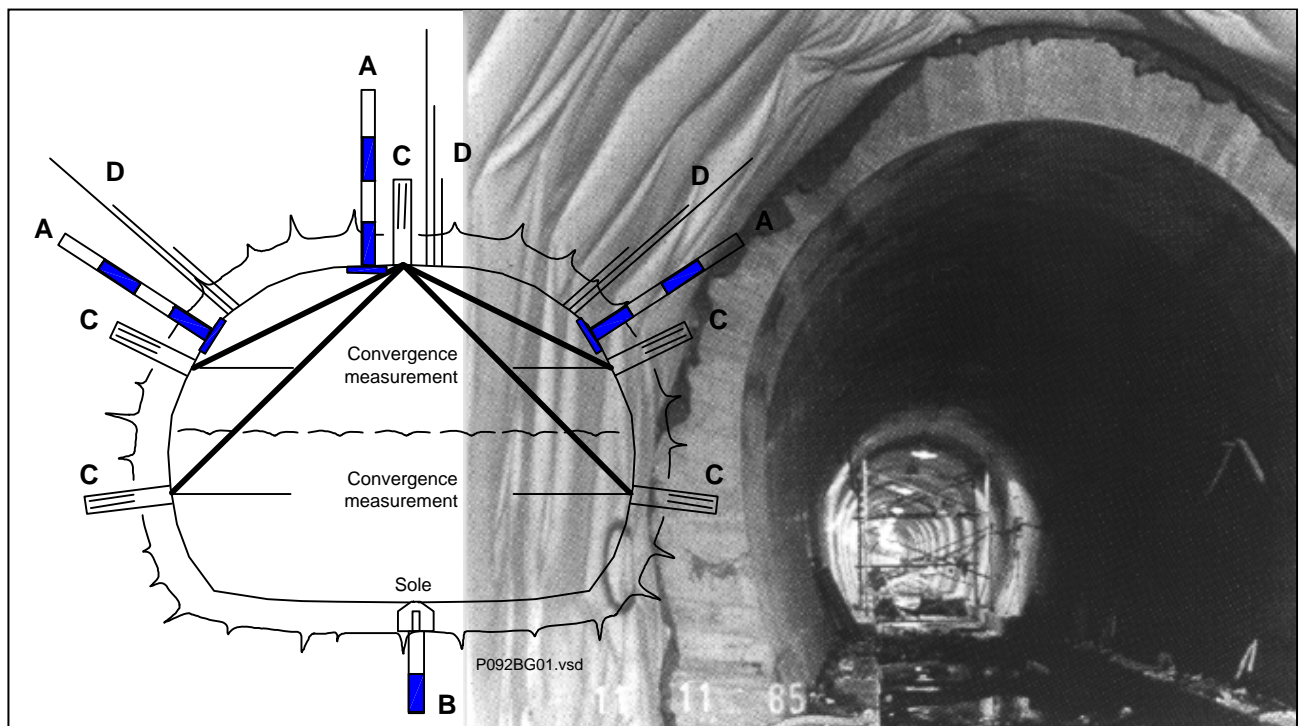
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Based on the system of the SWELLEX anchors of Atlas Copco, Glötzl developed a new instrumentation technique which includes the advantages of this anchor system. The basic principle is a folded tube which has been modified by the company Glötzl in regard to the measuring and installation equipment being of great importance for tunnel work.

Main advantages compared with conventional instruments known up to now:

- Immediate availability resp. measuring readiness after installation
- Uncomplicated installation in all measuring positions and directions
- Shortest installation times (only some minutes) without mortar or plastics
- Standard boreholes, diameters according to instrument 32 - 52 mm

Instrumentation of a NATM measuring cross section for displacement measurements

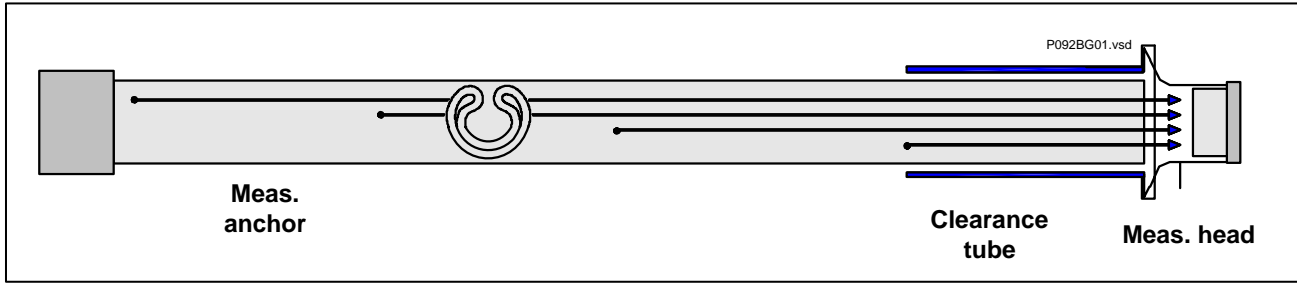


A - Meas. anchors with load cells
C - Hydraulic convergence bolts for
mechanical and geodetic measurement

B - Base measuring points
D - Extensometers with hydraulic
anchor points in single boreholes

Measuring Anchor

SMA



For the use of the SWELLEX anchor system in tunnelling, we have developed a measuring anchor for measurement-technical support.

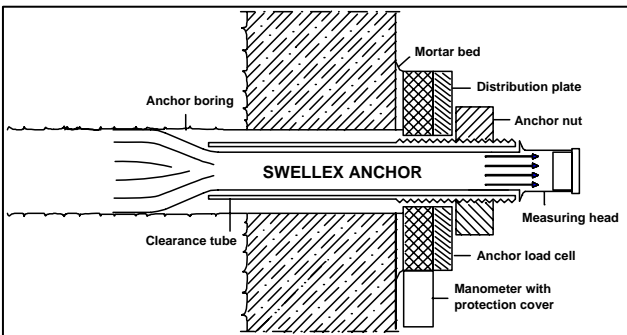
It consists of a standard SWELLEX anchor which is altered by Glötzl to a measuring anchor. This means that traction rods are mounted inside; the longitudinal deformation of these rods are measured at the head.

The anchor models are available according to the anchor types SWELLEX and SUPER-SWELLEX in standard lengths of 2, 3, 4, 6 und 9 m.

Further lengths on request.

The system can be completed by equipment of the instruments with load cells.

| Model | Load [kN] | L [m] | Drilling Ø [mm] | Weight [kg] | Article No.: |
|-----------------|-----------|-------|-------------------|-------------|--------------|
| SMA 11/2 | 110 | 2 | 32 up to 39 | 4 | 92.10.01.02 |
| SMA 11/3 | 110 | 3 | | 6 | 92.10.01.03 |
| SMA 11/4 | 110 | 4 | | 8 | 92.10.01.04 |
| SMA 11/6 | 110 | 6 | | 12 | 92.10.01.06 |
| SMA 11/9 | 110 | 9 | | 18 | 92.10.01.09 |
| SMA 22/2 | 220 | 2 | 43 up to 52 | 8 | 92.10.02.02 |
| SMA 22/3 | 220 | 3 | | 12 | 92.10.02.03 |
| SMA 22/4 | 220 | 4 | | 16 | 92.10.02.04 |
| SMA 22/6 | 220 | 6 | | 24 | 92.10.02.06 |
| SMA 22/9 | 220 | 9 | | 36 | 92.10.02.09 |
| Non-fixed tubes | | | | | |
| SMA11/F.5 | | 0.5 | 34 - 39 | 1 | 92.10.50.01 |
| SMA 22/F.5 | | 0.5 | 46 - 52 | 2 | 92.10.50.02 |



Anchor load cells with attachment and clamping nut for SWELLEX anchors, mechanical type with manometer or electric output signal:

| Mechanical type w. mano. | Load [kN] | Anchor Ø [mm] | Weight [kg] | Article |
|--------------------------------|-----------|---------------|-------------|-------------|
| TK100 A45 M1 | 100 | 45 | 5 | 40.10.01.01 |
| TK250 A55 M2.5 | 250 | 55 | 5 | 40.10.01.02 |
| Electrical type 4 - 20 mA | | | | |
| TK100 A45 E | 120 | 45 | 5 | 40.10.02.01 |
| TK250 A55 E | 250 | 55 | 5 | 40.10.02.02 |
| Attachment for load cell TK100 | | | 6 | 40.10.10.01 |
| Attachment for load cell TK250 | | | 6 | 40.10.10.02 |

Figure: Anchor load cell

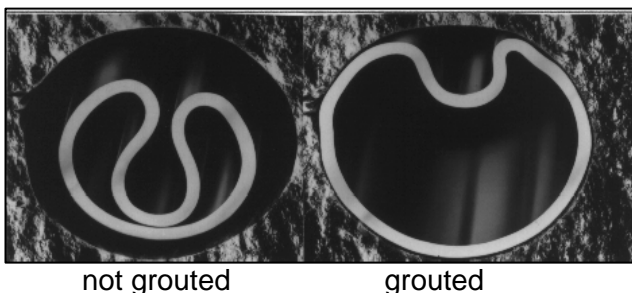
Dial gauge



Measuring equipment for mechanical measurement of measuring anchors with dial gauge or digital display:

| Model with | Type | Dial g. [mm] | Weight [kg] | Article No.: |
|-----------------|--------|--------------|-------------|--------------|
| Dial gauge | ASAM30 | 30 | 1.2 | 92.10.50.10 |
| Digital display | ASAD30 | 30 | 1.2 | 92.10.50.11 |

Conception of the SWELLEX system



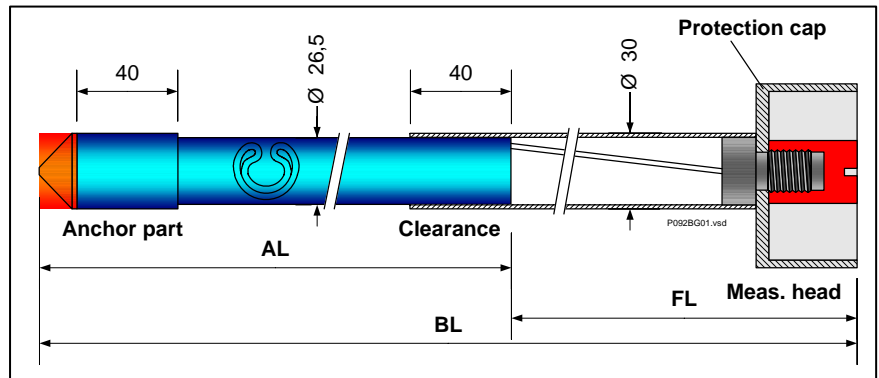
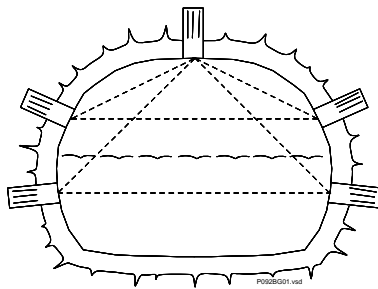
The anchor part consists of a folded tube which is widened by water pressure after installation in the borehole. The outer casing is adapted to the rock and is deformed acc. to the unevennesses. Thus, a strong and permanent adhesion with the rock is granted.

The main advantage compared with methods known up to now is that it can be used immediately and without any cement or plastics and also without tension or beating works.

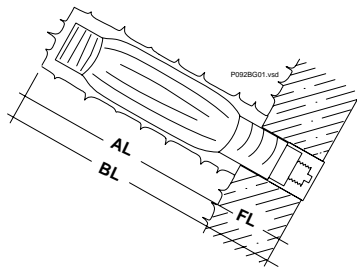
CONVERGENCE BOLTS

SKM

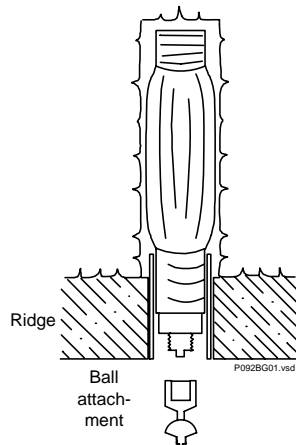
Measuring cross section
with convergence bolts



Stand. installation



Bolts with clearance
in concrete



Accessories see program for standard convergence bolts

Installation of convergence bolts with hydraulic anchor immediately after drilling procedure and thus immediate readiness to work already before spraying shotcrete.

Anchoring of the bolts is done in the rock; therefore the rock movements can exactly be recorded.

By placing a plastic tube over the anchor in the area of shotcrete, a clearance in concrete can be achieved.

The bolts can be used countersunk, injected resp. installed and thus are best possible protected against damage during blasting and advance works.

| Model | Length BL [mm] | FL [mm] | AL [mm] | Drilling ø [mm] | Weight [kg] | Article No.: |
|--|----------------|---------|---------|-------------------|-------------|--------------|
| SKM 32/200 | 600 | 200 | 400 | 32 up to 39 | 1 | 90.30.01.01 |
| SKM 32/250 | 650 | 250 | 400 | | 1.1 | 90.30.01.02 |
| SKM 32/300 | 700 | 300 | 400 | | 1.2 | 90.30.01.03 |
| SKM 32/350 | 750 | 350 | 400 | | 1.3 | 90.30.01.04 |
| SKM 43/200 | 600 | 200 | 400 | 43 up to 52 | 2 | 90.30.11.01 |
| SKM 43/250 | 650 | 250 | 400 | | 2.2 | 90.30.11.02 |
| SKM 43/300 | 700 | 300 | 400 | | 2.4 | 90.30.11.03 |
| SKM 43/300 | 750 | 350 | 400 | | 2.6 | 90.30.11.04 |
| For clearance in concrete area, please add article No. with .1 | | | | | | |
| Protection cap SKS 32 of PVC | | | | | 0.1 | 90.30.50.01 |
| Protection cap SKS 43 of PVC | | | | | 0.1 | 90.30.50.02 |

- Bolt elongations
- Ridge tackle
- Special models acc. to client's request
- Ball top attachm.
- Reflectors
- Meas. rod suspension
- Luminous diode tops

Hand pump SPH

Hand pump SPH with water container (5 l) for grouting of anchor systems with required connections

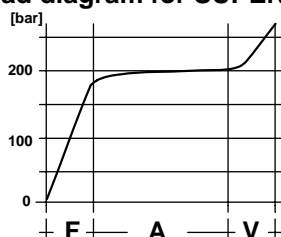
- Pressure range max. 300 bars, weight 12 kgs

Electric motor pump SPM

Electric motor pump with separate water container for grouting of anchor systems with required connections

- Connection 230 V, 50 Hz, 2.2 kW
- Pressure max. 400 bars
- max. 2.2 l/min.
- Weight 50 kgs

Load diagram for SUPER-SWELLEX



- Approx. values:
- F - Filling of anchor part
 - A - Widening of anchor till reaching the rock
 - V - Grouting at the rock

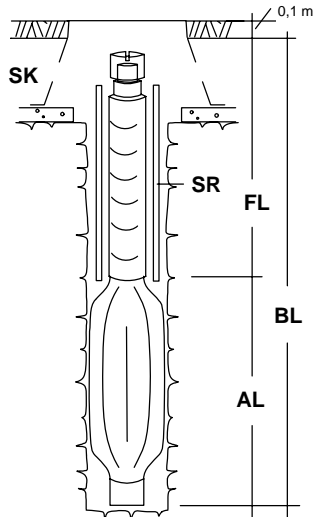
Installation instructions:

Push the anchor part in borehole to the requested position. Install the anchor part via special connection by means of a hand or motor pump.

Required pressure see diagram opposite. After reaching the final pressure, there is a secured and high-loadable compound by the own stiffness of the expanded steel tube and the contact to the unevennesses of the rock.

Surveying Points

SVM



Frost-resistant surveying points can be produced with the hydraulic anchor system quickly, secured and immediately ready for use.

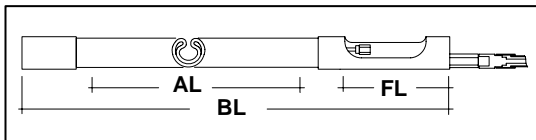
In order to keep away the surface movement from anchor part, a protection cover of plastic is fitted in the upper part of the system.

| Model | L=BL [mm] | FL [mm] | AL [mm] | Drill Ø [mm] | Weight [kg] | Article No.: |
|---------------------------------------|-----------|---------|---------|--------------|-------------|--------------|
| SVM 32/1000 | 1000 | 500 | 500 | 34-39 | 1,5 | 90.40.01 |
| SVM 32/1300 | 1200 | 700 | 500 | 34-39 | 1,9 | 90.40.02 |
| SVM 43/1000 | 1000 | 500 | 500 | 46-52 | 2,5 | 90.40.11 |
| SVM 43/1300 | 1200 | 700 | 500 | 46-52 | 3,3 | 90.40.12 |
| Street protection cap DIN 4055 | | | | | | 60.01.04.31 |

BL = Bolt length AL = Anchor length FL = Clear length
SR = Protection cap SK = Street protection cap

Extensometer- Hydraulic Anchor

SEA



Glass fibre rod extensometer GKSE 16

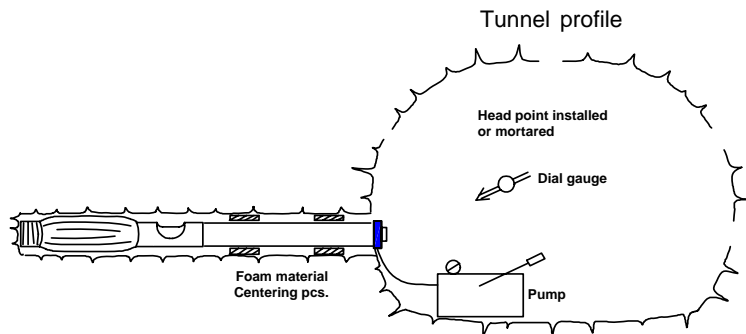
Hydraulic anchors in connection with the Glötzl glass fibre rod extensometer GKSE 16 represent the best possible instrumentation for an installation on site with immediate measuring standby. This especially applies in case of severe water entrance and a rock with a high degree of deep fissures where conventional cementations will be complicated.

For very aggressive water up to a pH-value of 14, coated anchors are available as special models.

| Model | L.=BL [mm] | FL [mm] | AL [mm] | Drill. ø [mm] | Weight [kg] | Article No.: |
|-------------------|------------|---------|---------|---------------|-------------|--------------|
| SEA 32/700 | 700 | 200 | 300 | 32-39 | 1,2 | 60.06.01 |
| SEA 32/900 | 900 | 200 | 500 | 32-39 | 2,4 | 60.06.02 |
| SEA 43/700 | 700 | 200 | 300 | 43-52 | 1,4 | 60.06.11 |
| SEA 43/900 | 900 | 200 | 500 | 43-52 | 2,8 | 60.06.12 |



The hydraulic anchor is screwed on the completely assembled extensometer. Push the complete unit into the borehole and grout the anchor by means of water.



Hydraulic Anchor

- Immediate effectiveness
- No mortar or injection material
- Small dimensions
- Installation in standard anchor borings

SEA

Glass Fibre Rod Extensom. GKSE

- Delivered assembled ready for use
- Small dimensions and light weight
- Each length can be installed in smallest space
- Factory dimension 1 m winding diameter

Remarks:

SWELLEX is a registered trade mark of the company ATLAS-COPCO. The products of Glötzl on the basis of the SWELLEX system are individual units which are manufactured on the

basic material of the SWELLEX anchors. Any liability for the instruments described in this leaflet is hold by the company Glötzl Gesellschaft für Baumeßtechnik mbH.