Anchor Load Cells

In rock and base engineering anchors are applied as construction element. They stabilise the rock by absorbing axial load and shear forces. Especially in case of continuously installed anchors the observing control of the initial stressing force of anchors as bearing elements of a construction is very important.

In most cases the initial stressing force of light soil and rock anchors is secured by installing them with the help of a torque wrench adjusted to a desired value. We recommend to control the torque of the wrench by installing load cells at particular anchors.

The initial stressing force of light, mobile anchors and of heavy ones, where a tension device is normally used to tighten them, should always be controlled by anchor load cells. Furthermore the temporal development of the initial stressing force can be observed, which is very complicated with other methods as for example by the lift-off test.

With continuously installed anchor load cells the initial stressing force can be determined at any time, the measured values can be recorded by remote transmission or automatically scanned by a data acquisition system at a fixed measuring rhythm.

Among the different types that are used as anchor load cells

- the electric anchor load cells (the compression is measured by strain foil gauges) and
- the hydraulic anchor load cells (the initial stressing force is measured by a hydraulic pressure cell)

are the most important ones.

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Hydraulic anchor load cells system Glötzl consist of a piston pad made of two stiff ring disks with annular grooves at their edges that enable - albeit slight - relative movement (Fig. 1).

The pressure chamber of this piston pad is filled with hydraulic liquid and has an exactly defined area to enable conversion of the measured liquid pressure into force.

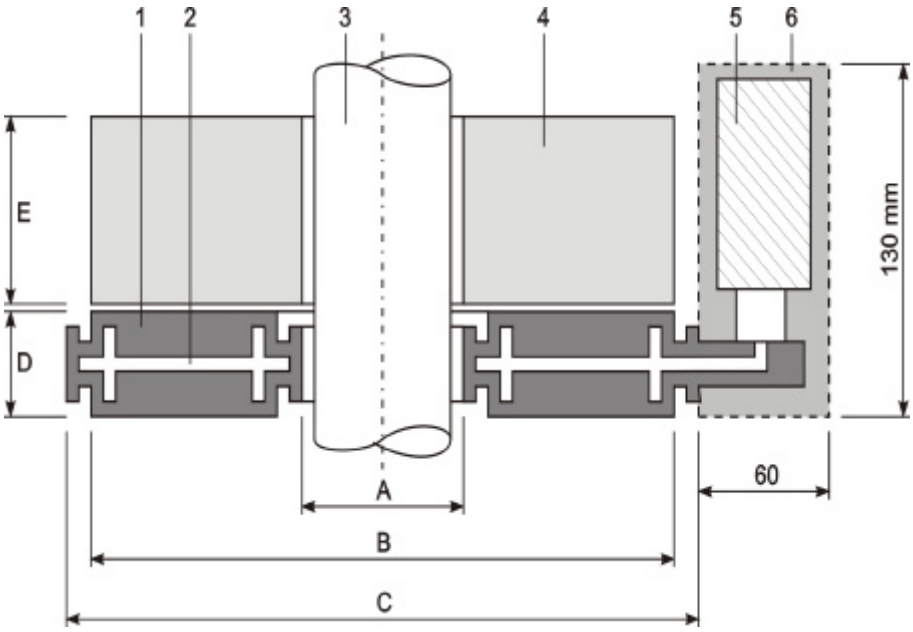

Fig. 1 Schematic drawing of a direct-reading anchor load cell Type M

1	Piston pad	4	Load distribution plate
2	Hydraulic liquid	5	Gauge manometer
3	Anchor	6	Protective hood

The pressure of liquid in the piston pad can be determined as follows:

- By direct measurement with a manometer (Type M)
- By electric remote reading with a pressure sensor (Type D)
- By hydraulic remote reading with a compensation valve (Type VHD)

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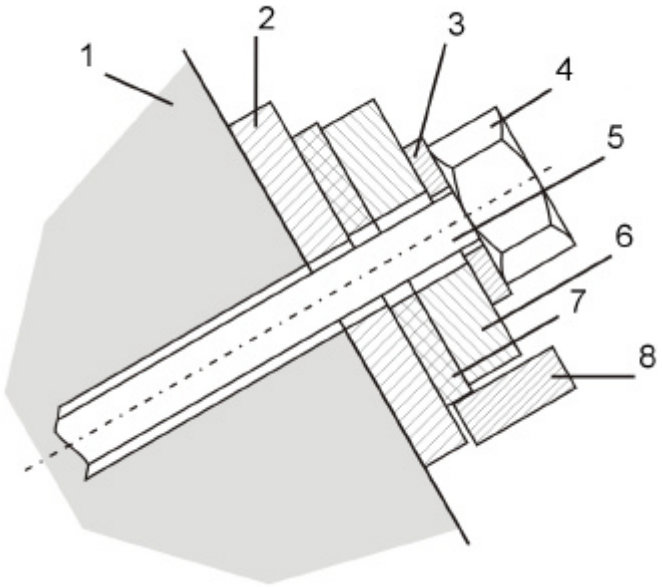
Standard anchor load cells Type M and Type D are manufactured for the following load ranges and dimensions:

Type M, D	Load kN		Dimensions* mm					Weight kg
	nom.	max.	A	B	C	D	E	
KN 250 A 35 M 2,5	250	300	35	123	144	28	30	7
KN 500 A 50 M 4	500	600	50	144	165	28	40	11
KN 750 A 75 M 4	750	900	75	180	202	28	40	16
KN 1000 A 105 M 4	1000	1200	105	219	240	28	45	24
KN 1400 A 105 M 6	1400	1600	105	219	240	28	45	24
KN 2000 A 135 M 6	2000	2400	135	265	288	30	65	43
KN 5000 A 160 M 6	5000	6000	160	380	408	50	85	122

* see Fig. 1; further load ranges and dimensions are available on request

It is advisable to install the anchor load cells with a base plate and a load distribution plate as shown in Fig. 2.



1 Structure
2 Base plate
3 Clamping nut washer
4 Clamping nut
5 Anchor
6 Load distribution plate
7 Anchor load cell
8 Gauge manometer

Fig. 2 Head configuration of a rock anchor with a direct-reading anchor load cell Type M

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Direct-reading anchor load cells can be used whenever the anchor head is accessible, enabling the manometer to be read. The standard version works with a measuring accuracy of ± 1 percent; the temperature error at 20 degrees temperature differential is 1.2 percent of the load range.

With the hydraulic-electric anchor load cell, the pressure of the hydraulic liquid in the piston pad is recorded with an electric pressure sensor (Fig. 3).

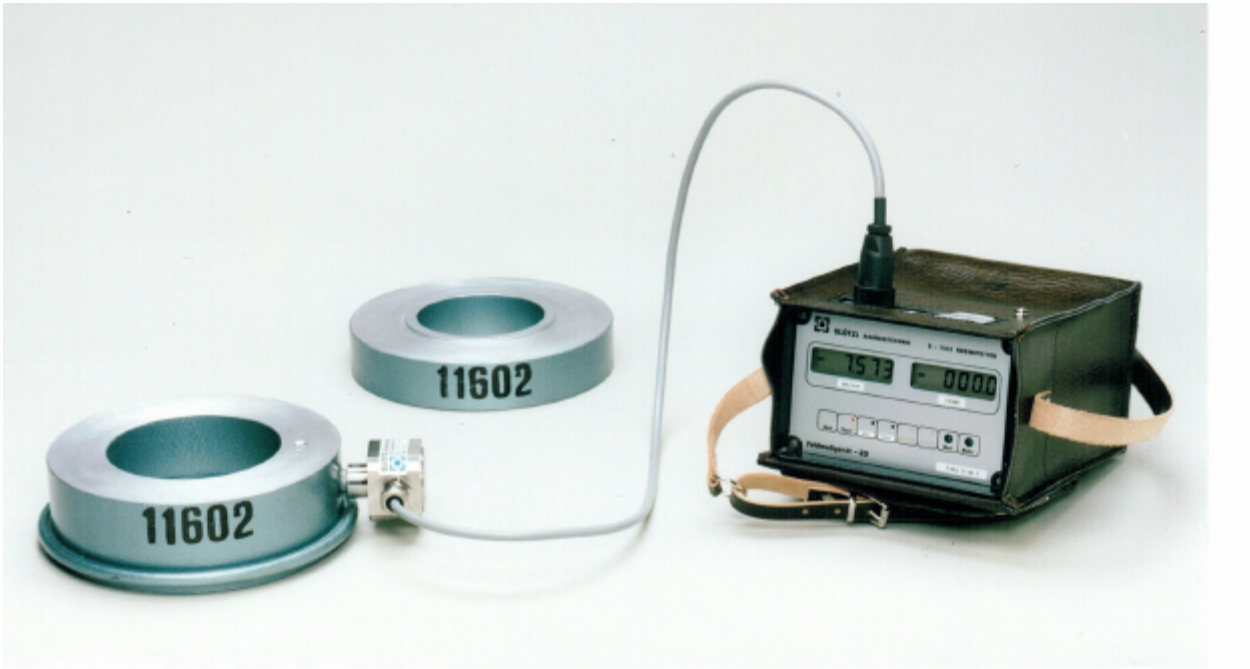

Fig. 3 Anchor load cell Type D, with electric pressure sensor

The portable digital readout unit FMG can be used to take the measurements (in conjunction with a manual measuring point selector it can also be used at several points). It is also possible, however, to collect measured values automatically via a central data acquisition system.

Anchor load cells with electric pressure conversion work with a measuring accuracy of ± 0.5 %. The temperature error at 20 degrees temperature differential amounts to approx. 1.2 percent of the load range.

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In the case of hydraulic remote measurements, the liquid pressure in the piston pad of the anchor load cell is measured via a compensation valve (see Fig. 4).

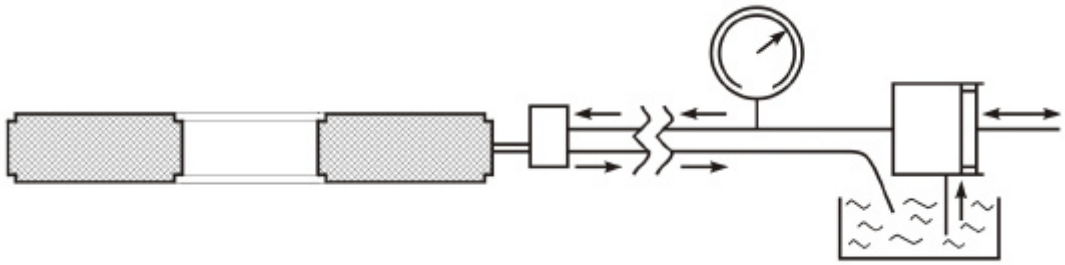

Fig. 4 Measuring principle of the anchor load cell Type VHD

Anchor load cells Type VHD are manufactured in the following load ranges and dimensions:

Type KN . . A . . VHD	Load kN		Dimensions mm					Weight kg
	nom.	max.	A	B	C	D	E	
KN 250 A 35 VHD 2,5	250	280	35	123	144	28	30	7
KN 500 A 50 VHD 4	500	580	50	144	165	28	40	11
KN 750 A 75 VHD 4	750	850	75	180	202	28	40	16
KN 1000 A 105 VHD 4	1000	1150	105	219	240	28	45	24
KN 1400 A 105 VHD 4	1400	1530	105	244	266	28	45	24
KN 2000 A 135 VHD 4	2000	2350	135	204	328	30	70	59
KN 5000 A 160 VHD 4	5000	5550	160	446	474	50	85	168

Further load ranges on request

The following equipment can be used to record measured values at anchor load cells with a compensation valve:

- Hand pump with distribution group and gauge manometer
- Electric motor pump with distribution group and gauge manometer or an
- Automatic measuring and recording unit.

The length of the pressure and return lines between the measuring sensor and the central data acquisition system can amount to several hundred metres.

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Sales Information

3.1.2.1 Hydraulic anchor load cell type M with manometer
d = 100 mm, class 1.0, until 250 kN,
inner diameter d = 35 mm,
incl. 1 load distribution plate

3.1.2.2 dito until 500 kN, inner diameter d = 50 mm

3.1.2.3 dito until 750 kN, inner diameter d = 75 mm

3.1.2.4 dito until 1000 kN, inner diameter d = 105 mm

3.1.2.5 dito until 1400 kN, inner diameter d = 105 mm

3.1.2.6 dito until 2000 kN, inner diameter d = 135 mm

3.1.2.7 dito until 5000 kN, inner diameter d = 160 mm

3.1.2.8 Hydraulic anchor load cell type VHD with
hydraulic compensation valve for remote reading,
until 250 kN, inner diameter d = 35 mm,
incl. 1 load distribution plate

3.1.2.9 dito until 500 kN, inner diameter d = 50 mm

3.1.2.10 dito until 750 kN, inner diameter d = 75 mm

3.1.2.11 dito until 1000 kN, inner diameter d = 105 mm

3.1.2.12 dito until 1400 kN, inner diameter d = 105 mm

3.1.2.13 dito until 2000 kN, inner diameter d = 135 mm

3.1.2.14 dito until 5000 kN, inner diameter d = 160 mm

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