

Among the hydraulic pressure cells available for measuring stress in components, stress transducers System Glötzl have proven their worth on numerous occasions. They have been installed in many tunnel excavations to measure radial and tangential stresses, but they also find application in fills and dams as earth pressure transducers. The hydraulic pressure pad is equipped with a compensation valve for remote reading of the liquid pressure in the pad (see Fig. 1).

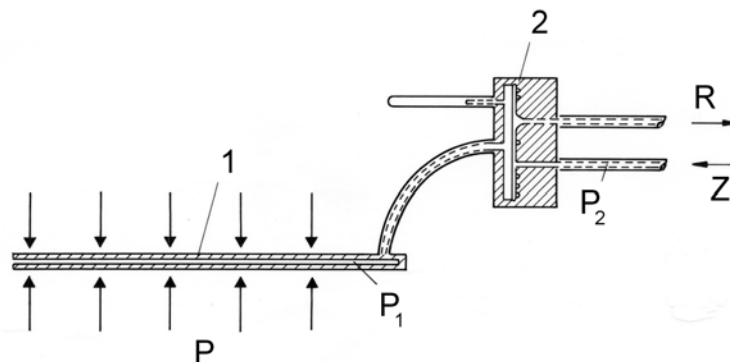


Fig. 1 Hydraulic pressure cell, System Glötzl (schematic), consisting of a pressure pad and hydraulic valve. Z = Pressure line, R = Return line, p = Ambient pressure, 1 = Pressure Pad, 2 = Membrane (from FECKER and REIK, 1987)

With this type of hydraulic pressure cell, the pressure p_1 inside the pressure pad acts on a metal membrane, which is pressed as a result against a plate and closes two boreholes that are located there. A counter pressure p_2 is increased steadily through one of the boreholes (Z) until the membrane lifts off the plate. When this happens, the two boreholes become connected in a fluidic system, i. e. the lifting of the membrane is accompanied by an escape of pressure medium at the second borehole (R). The counter pressure p_2 required to bring about this condition is thus equal to the pressure p_1 acting in the measuring cell. Very small membrane movements are sufficient to produce a reading, i. e. the measuring cell has a "very hard" operating characteristic.

Concrete pressure transducers with re-tensioning tube (Fig. 2) are ideal for use on in situ concrete components in thicknesses starting from 150 mm or in shotcrete tunnel linings. Setting of the concrete produces a setting temperature that causes the temperature of the transducer to rise, too. The pressure pad filling expands during this



phase (increasing the thickness of the pressure pad), and the still unhardened concrete deforms plastically. When the setting process is over, the temperature drops and the volume of liquid, i. e. the pressure pad, contracts. The shrinkage gap thus formed can be compensated by using the re-tensioning tube to press additional liquid into the pressure pad. Full contact is then restored, enabling uncorrupted stress readings.

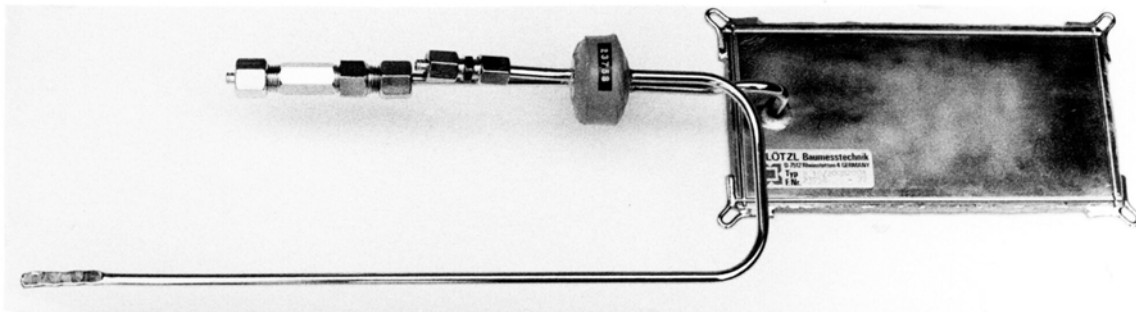


Fig. 2 Valve transducer for concrete stresses, Type B 10/20 QM200A Z4 N50, version with four fixing eyelets and a re-tensioning tube N50 = 50 cm

Joint pressure transducers without re-tensioning tube (Fig. 3) are suitable for measuring bearing pressure and wall pressure, and they can also be used to take rock pressure measurements on tunnel linings (joint pressure measurements).

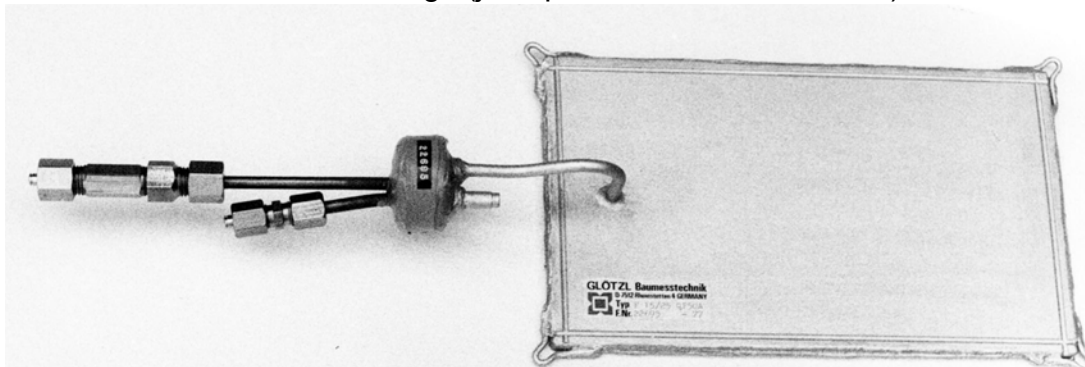


Fig. 3 Valve transducer for concrete stress and joint pressure, Type F 15/25 QF50A Z4 with four fixing eyelets



1. Pressure pad designation	12	17	7/14	10/20
Dimensions in mm	dia. 120x5	dia. 170x7	70x140x4.5	100x200x5

Pressure pad designation	15/25	20/30	40/40
Dimensions in mm	150x250x75	200x300x10	400x400x12

- 2. Design:**
- Q = Pressure pad filled with mercury for using the transducer in surrounding material with a modulus of elasticity > 10,000 bar
- K = Pressure pad filled with hydraulic oil for using the transducer in surrounding material with a modulus of elasticity < 10,000 bar

3. Load capacity:

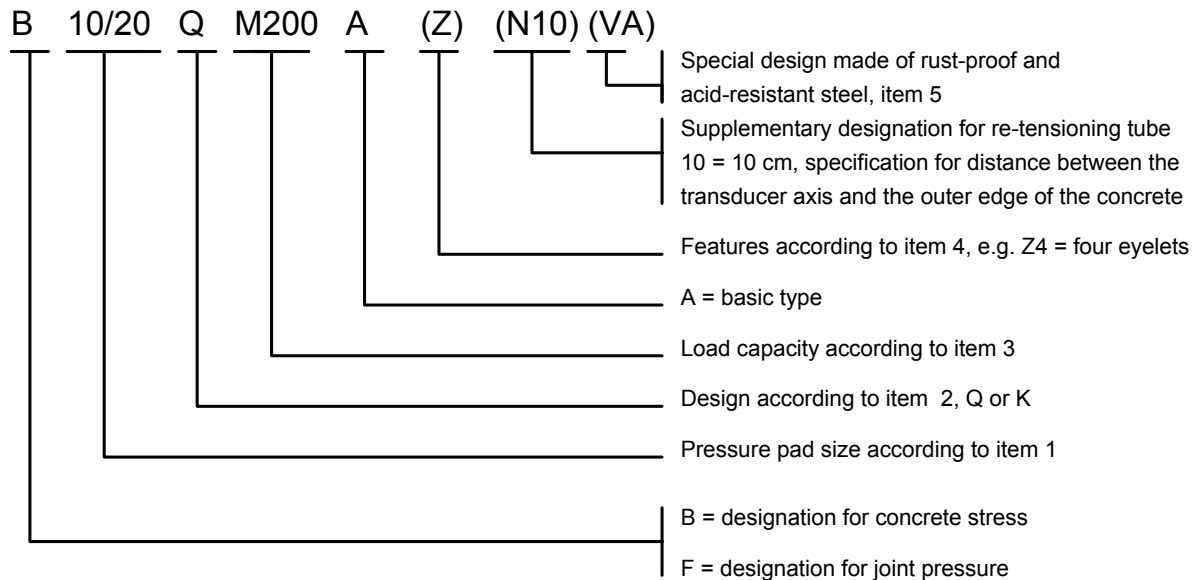
- F 20 = up to 20 bar for air operation, control accuracy ± 0.02 bar
- F 50 = up to 50 bar for oil operation, control accuracy ± 0.05 bar
- M 200 = up to 200 bar for oil operation, control accuracy ± 0.20 bar
- S 400 = up to 400 bar for oil operation, control accuracy ± 1.0 bar

All versions feature 4-fold overpressure protection under dynamic loading.

- 4. Features:**
- Z2 Two fixing eyelets opposite the valve on the pressure pad
- Z4 Four fixing eyelets at the corners of the pressure pad
- 5. Valve transducers:** Sizes 7/14, 10/20, 15/25 and 20/30 are available for installation in aggressive media as special versions made of rust-proof and acid-resistant steel, designation VA.

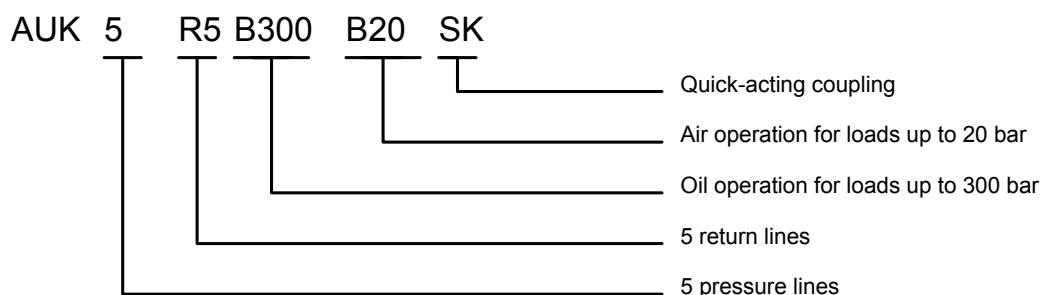


Type code for valve transducers e. g.



- 6. Accessories:**
- Connection boxes, connection and distribution boxes, distribution groups
 - Hand measuring pumps and electric motor pumps for oil operation; air volume controllers for air operation
 - Pressure lines and couplings

Connection and distribution boxes are available with 2 to 12 pressure lines and 2 to 12 return lines for oil or air operation, e. g.



Dimensions: 200 mm high, 80 mm deep, 240 mm long for two measuring points, plus 80 mm for each additional point

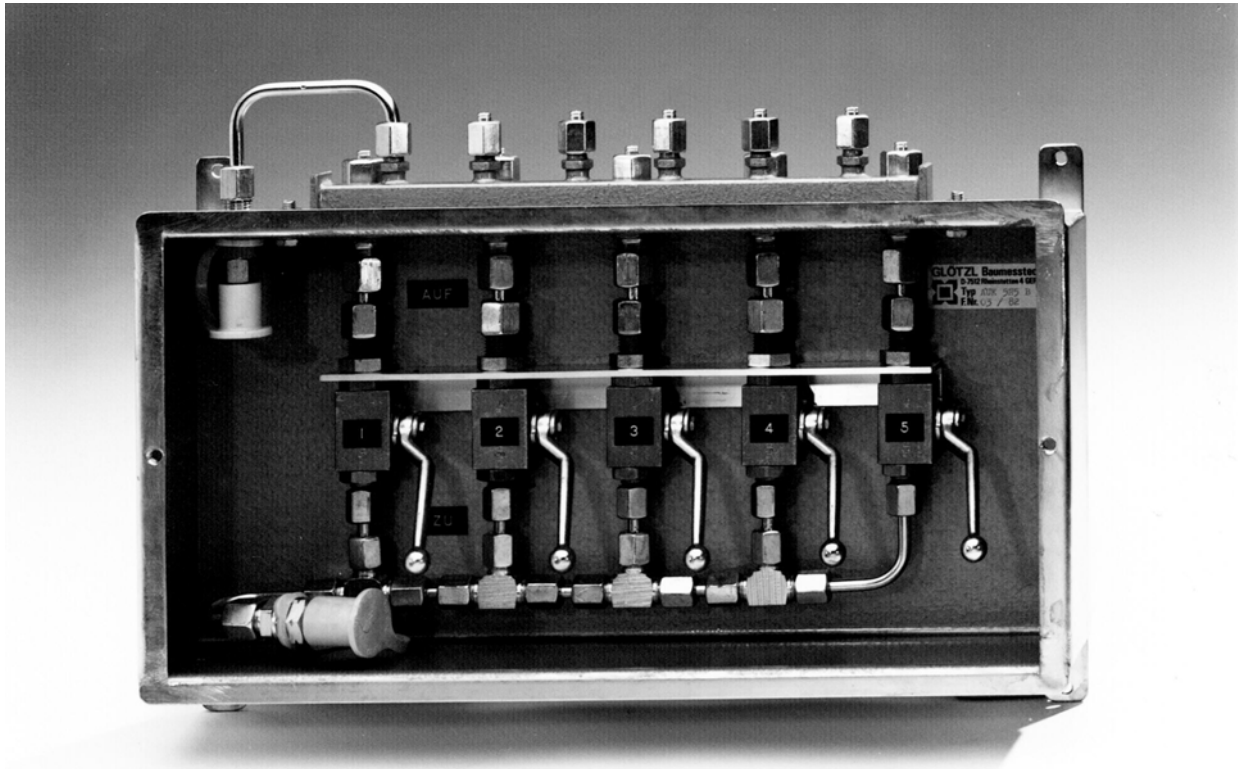


Fig. 4 Connection and distribution box Type AUK 5 R5 B 300 SK for taking five pressure lines and five return lines from one concrete component, with changeover cocks for direct connection of a hand pump or motor pump

A hand measuring pump is required to measure pressures in the stress transducers. One valve transducer can be connected directly to the hand pump. Any number of valve transducers can be connected and read in series by means of a distribution group, which can act as the hand pump chassis, or by means of a distribution box like the one described above. The hand pump is designed for pressures from 0 - 300 bar, depending on the manometer measuring range.

Hand measuring pumps with one (M1) or two (M2) measuring ranges are available.

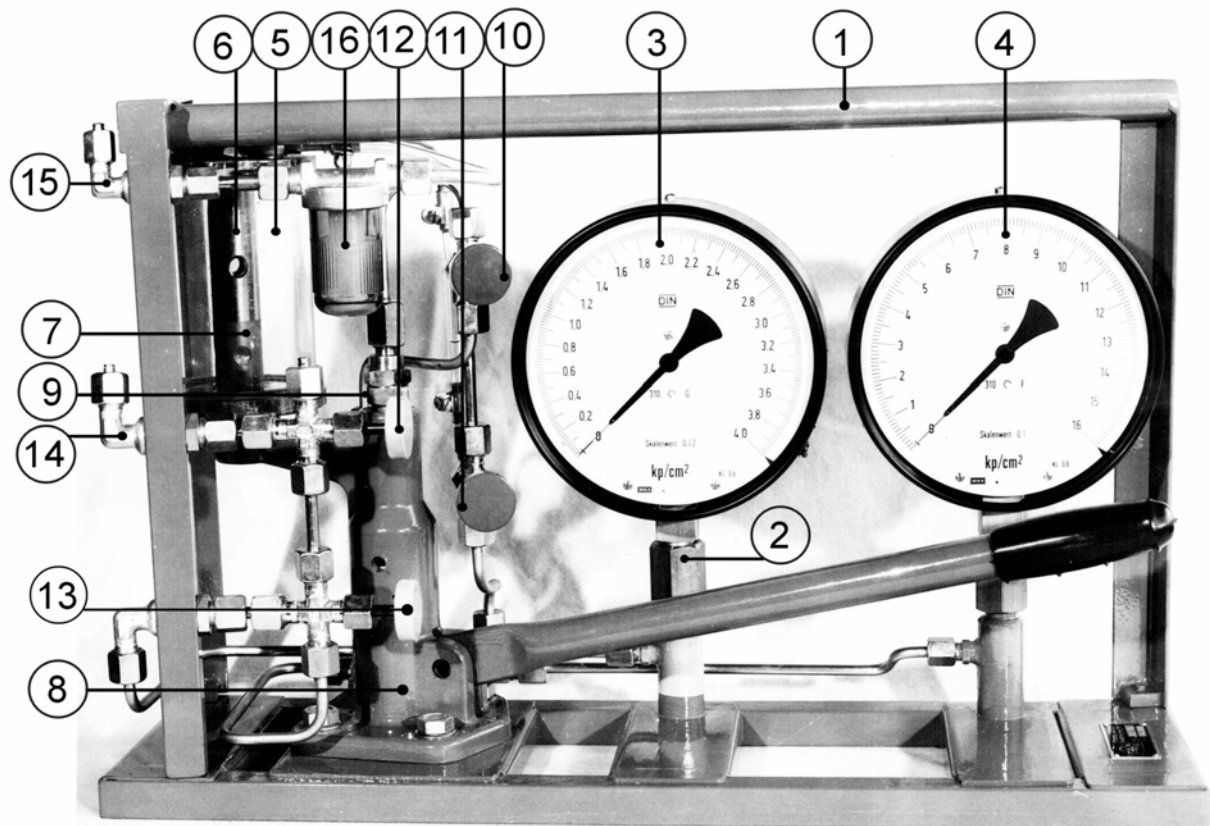


Fig. 5 Hand measuring pump, Type M 2 H 16, for filling the measuring lines and for taking manual readings of valve transducers

Components of the hand measuring pump:

- | | | | |
|---|--|----|--|
| 1 | Frame with manometer support | 9 | Choke with valve |
| 2 | Sleeve coupling, R 1/2" / M 20 x 1.5 L | 10 | Choke cock "blue" |
| 3 | Precision manometer dia. 160 mm
Connection R 1/2" below (small measuring range) | 11 | Pressure-relief cock "red" |
| 4 | Precision manometer dia. 160 mm
Connection R 1/2" below (large measuring range) | 12 | Shut-off cock "yellow" for the
pressure line |
| 5 | Container, capacity approx. 0.4 l | 13 | Shut-off cock "green" for manometer
(small measuring range) |
| 6 | Filler neck | 14 | Pressure line connection |
| 7 | Oil filter | 15 | Return line connection |
| 8 | Piston pump | 16 | Return line filter |

**Sales Information**

- 3.4.1 Valve transducer for concrete stress type B 10/20, load capacity up to 200 bar, 100x200 mm, with 4 fixing eyelets and re-tensioning tube (filled with mercury or oil), control accuracy +/- 0.2 bar
- 3.4.2 Valve transducer for concrete stress and joint pressure, type F 15/25, load capacity up to 50 bar, 150x250 mm, with 4 fixing eyelets (filled with oil), control accuracy +/- 0.05 bar
- 3.4.3 Measuring line polyamide-11 consisting of pressure line 6/2 dia., transparent, and return line 6/3 dia., black, load capacity up to 120 bar, 3-fold overpressure protection, filled with oil
- 3.4.4 dito, pressure line 6/3 dia., return line 6/3 dia., load capacity up to 75 bar, 3-fold overpressure protection
- 3.4.5 High-pressure measuring line consisting of pressure line 8/4 dia, with fabric ply and return line 6/3 dia, black, load capacity up to 500 bar, filled with oil
- 3.4.6 Connection and distribution box type AUK made of rust-proof and acid-resistant steel, with cover to unscrew, for oil operation up to 300 bar
- 3.4.7 dito with quick-acting coupling for pressure and return line
- 3.4.8 dito for further connections of pressure and return lines
- 3.4.9 Hand measuring pump to measure pressures in the stress transducers type M2H16 for oil operation with two manometers, 160 mm dia., class 0.6, reversible, connection lines with quick-acting couplings, length 2 m