HYDRAULIC BOREHOLE PRESSURE CELLS

GEOKON®

MODEL 3200

Model 3200HH (front) and Model 3200WiKA (rear).

APPLICATIONS

The Model 3200 Hydraulic Borehole Pressure Cells are designed for the measurement of rock stress changes in…

- Coal mines
- Hard rock mines
- Support pillars
- Roof and walls of underground openings
- Evaporite deposits (salt, potash, trona etc.)

OPERATING PRINCIPLE

The Borehole Pressure Cell (BPC) is designed to monitor stress changes in rock. In use, the cell is grouted into a borehole drilled into the rock. When the grout has hardened the cell is connected to a hydraulic hand pump and pressurized to a pressure approximating the estimated in-situ stress level. (A check valve maintains the pressure inside the cell when the pump is removed). Stress changes within the rock are transmitted to the cell, causing proportionate changes in the hydraulic cell pressure, which are recorded by a pressure gauge and/or pressure transducer.

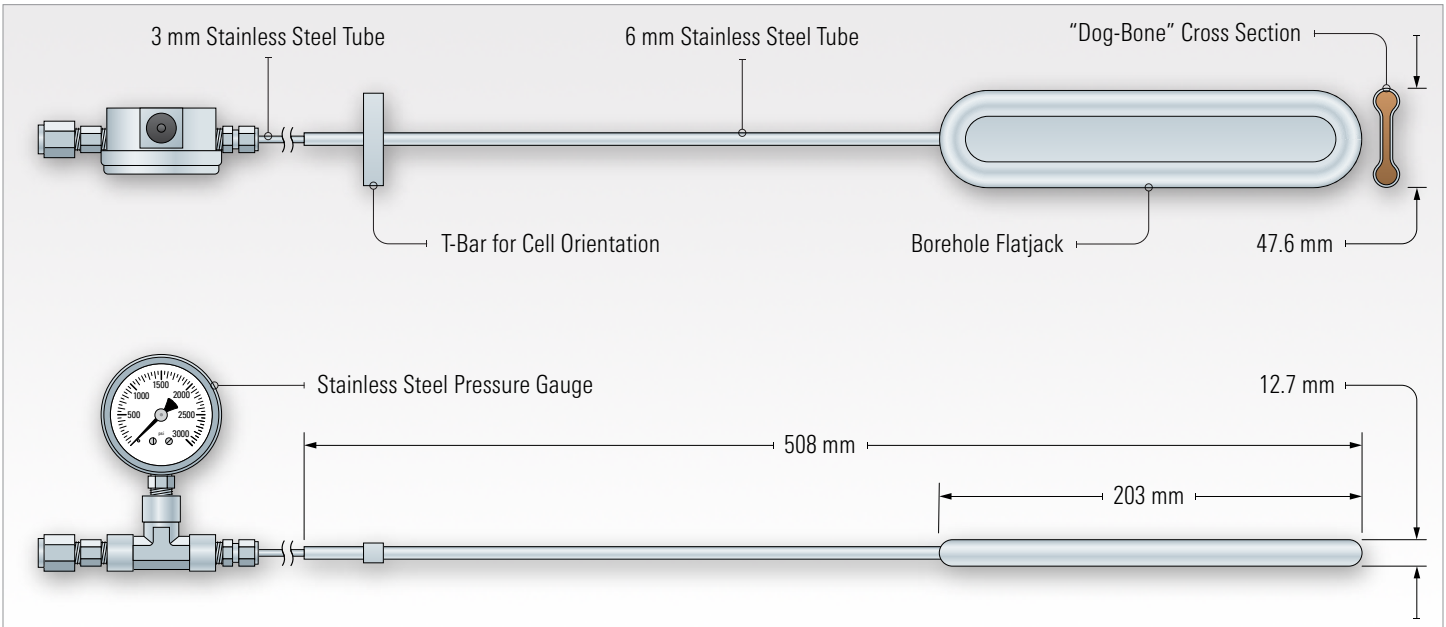
ADVANTAGES AND LIMITATIONS

The BPC reacts mainly to stress changes in the direction perpendicular to the plane of the cell (the average sensitivity to stress changes in the plane of the cell is only about 6%). If biaxial stress changes are required then two or three BPCs can be installed at different orientations in the same borehole or in adjacent boreholes.

The conversion of cell pressure changes to equivalent rock stress changes requires knowledge of the rock modulus. Procedures do exist for obtaining an in-situ calibration but they are somewhat complicated.

In rocks, which exhibit plastic behavior, such as salt, potash, trona, etc., the rock squeezes down onto the BPC until pressure equilibrium is achieved. Under these circumstances it is not unusual for the BPCs to record the absolute value of the insitu rock stress and not merely stress changes.

Model 3200WIkA with Model 3200-6 pre-encapsulated in a cylinder of quick-setting cement.



Model 3200 components and dimensions.

SYSTEM COMPONENTS

The BPC consists of a flatjack made from two steel plates welded together at their edges with the intervening space filled with hydraulic oil. The BPC has a "dog-bone" cross-section to allow it to expand and contract freely over a large range without splitting the welds. A length of high-pressure steel tubing is attached to the flatjack and leads to the outside of the borehole where a high-pressure Tee fitting allows the coupling of a pressure gauge and a check valve through which the cell can be inflated. A pressure transducer, (models 4500H or 3400), can be used along with or instead of the pressure gauge if remote or automatic reading capability is required.

BPCs are installed using setting rods, which engage a T-Bar on the hydraulic tubing close to the cell, so that the cells can be oriented in the desired direction.

Where grouting cannot conveniently be performed, the BPC flatjack can be pre-encapsulated in a cylinder of quick setting cement. The encapsulated cell is pushed to the required depth and orientation and then inflated as before.

SPECIFICATIONS

Standard Ranges	20, 35, 75 MPa
Resolution	0.25% of range (approximately)
Accuracy	0.25% F.S. (pressure gauge) 0.1% F.S. (4500HH VW Transducer)
Temperature Range	–20 °C to +80 °C
Borehole Size	57 mm
L × W × H	203 × 47.6 × 12.7 mm (borehole flatjack only) 508 × 47.6 × 12.7 mm (borehole flatjack w/stainless steel tube)

ORDERING INFORMATION

3200WIKA–20MPA: Hydraulic BPC with Pressure gauge, 20 MPa
3200WIKA–35MPA: Hydraulic BPC with Pressure gauge, 35 MPa
3200WIKA–75MPA: Hydraulic BPC with Pressure gauge, 75 MPa

3200HH–20MPA: Hydraulic BPC with 4500HH Sensor, 20 MPa
3200HH–35MPA: Hydraulic BPC with 4500HH Sensor, 35 MPa
3200HH–75MPA: Hydraulic BPC with 4500HH Sensor, 75 MPa

3200B–20MPA: Hydraulic BPC with 4500HH Sensor and Pressure gauge, 20 MPa
3200B–35MPA: Hydraulic BPC with 4500HH Sensor and Pressure gauge, 35 MPa
3200B–75MPA: Hydraulic BPC with 4500HH Sensor and Pressure gauge, 75 MPa

3200-3: BPC installation tool for boreholes to 15 m depth, with carrying case
3200-6: Cell encapsulation in quick-setting cement
3200-18: Hydraulic hand pump (0-20 MPa) for gauge filling or pressurization, with pressure gauge, quick-connect, and 2 m of 3 mm diameter SS tubing and fittings
02-250V6-E: Blue PVC Cable, 6 mm (0.250") Ø, 2 twisted pairs, for the above
02-250V6-M: Blue PVC Cable,6 mm (0.250") Ø, 2 twisted pairs, for the above
02-250P9LT-E: Violet Polyurethane Cable, 6 mm (0.250")", Low Temperature, 2 twisted pairs, 50 ohm, –40°C to +80°C
02-250P9LT-M: Violet Polyurethane Cable, 6 mm (0.250"), Low Temperature, 2 twisted pairs, 50 ohm, –40°C to +80°C

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