

# Total Pressure Cells



Vibrating Wire and Pneumatic Total Pressure Cells



Jackout Total Pressure Cell

## Applications

The total pressure cell measures the combined pressure of effective stress and pore-water pressure. Typical applications include:

- Monitoring total pressure exerted on a structure to verify design assumptions.
- Determining the magnitude, distribution, and orientation of stresses.

## Principle of Operation

Total pressure is the intergranular pressure in the soil (effective stress) combined with the pressure of water in the voids between soil grains (pore water pressure).

The pressure cell is formed from two circular plates of stainless steel whose edges are welded together to form a sealed cavity. The cavity is filled with a non-compressible fluid.

The cell is installed with its sensitive surface in direct contact with the soil. The total pressure applied to that surface is transmitted to the fluid inside the cell and measured with a pneumatic or vibrating wire pressure transducer.

## Installation

Total pressure cells are typically embedded in fill or fixed to a structure. In fill, cells are often installed in arrays. Each cell is placed in a different orientation and covered with hand-compacted fill. When mounted on a structure, the cell is placed into a recess so that its sensitive side is flush with the surface of the structure.

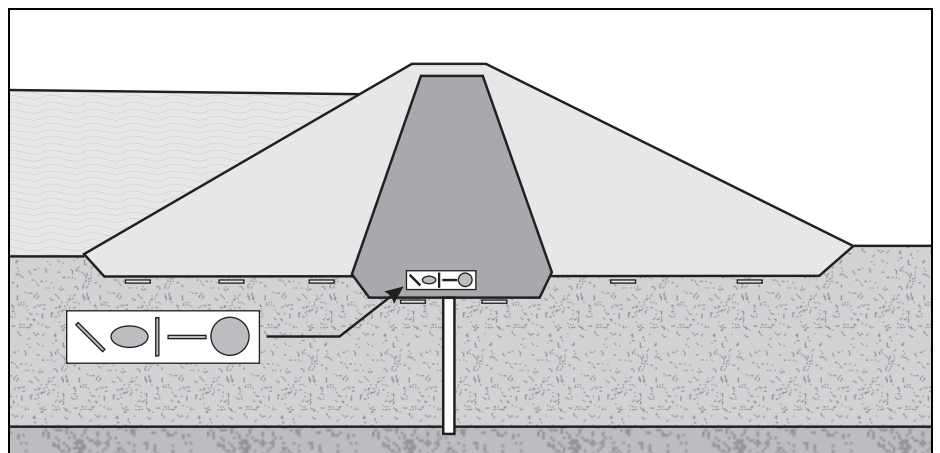
The jackout total pressure cell is specially designed for installation in cast-in-place structures, such as diaphragm walls. Its name is derived from the use of a hydraulic jack that is activated to keep the cell in contact with the soil during concreting. See drawing on back.

## Advantages

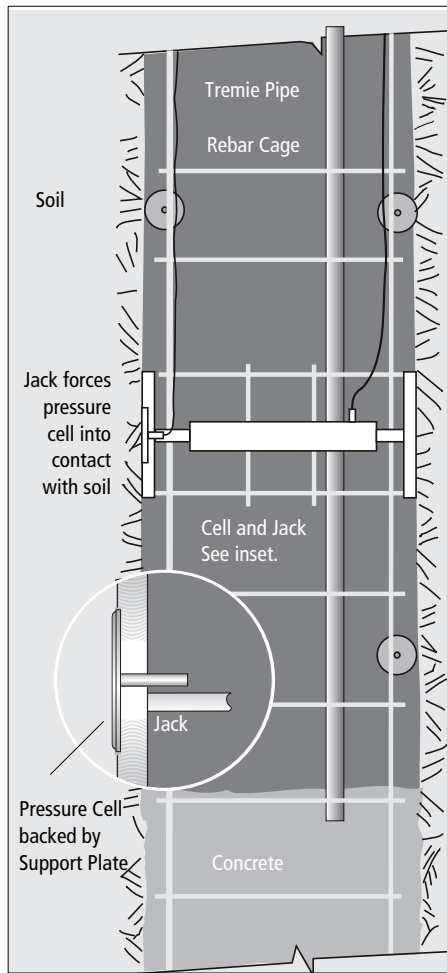
**Conformance:** To minimize bridging effects, the total pressure cell has a low profile and a modulus similar to that of a typical soil. Fluid in the cell is de-aired to maximize sensitivity.

**Pneumatic or Vibrating Wire:** The total pressure cell is available in a pneumatic or vibrating wire version.

**Manual or Automatic Readout:** The vibrating wire version can be read with a portable indicator or a data logger. The pneumatic version must be read with a portable readout.



Total pressure cells in an embankment dam. Detail shows multi-directional orientation of cells in an array.



### VW PRESSURE CELLS

- 3.5 bar (50 psi) Pressure Cell . . . . 52608220
- 7 bar (100 psi) Pressure Cell . . . . 52608230
- 17 bar (250 psi) Pressure Cell . . . 52608240
- 35 bar (500 psi) Pressure Cell . . . 52608250

The VW pressure cell includes the cell itself, a VW pressure transducer, and a thermistor or RTD for temperature measurement. Requires signal cable.

**Resolution:** 0.025% FS.

**Repeatability:** ±0.5% FS.

**Max. Pressure:** 150% rated range.

**Fluid:** Ethylene glycol, de-aired to 2 ppm.

**Dimensions:** Cell is 230 mm diameter and 11 mm thick (9 x 0.43"). Transducer and connecting tube is 410 mm (16") long. Dimension from sensitive surface to connector end of transducer is 180 mm (7").

**Weight:** 3.2 kg (7 lb).

### VW Jackout Cells

- 7 bar (100 psi) Jack-Out Cell . . . . 52618230
- 17 bar (250 psi) Jack-Out Cell . . . 52618240
- 35 bar (500 psi) Jack-Out Cell . . . 52618250

The VW jackout cell includes the cell, a VW pressure transducer mounted on the center of the cell, and a thermistor or RTD for temperature measurement. Requires signal cable. The rigid steel support plate, reaction plate, and double-acting hydraulic jack are supplied by the user.

### SIGNAL CABLE

**Polyvinyl Chloride (PVC) Cable . . .50613824**  
Shielded cable with four 22-gauge tinned-copper conductors and polyvinyl chloride (PVC) jacket. Attached to pressure transducer at factory.

**Universal Terminal Box . . . . .57711600**  
Not used if pressure cells are connected to data logger. Provides connections for 12 sensors and an indicator. Sensors selected by rotary switch. Weatherproof fiberglass box measures 290 x 345 x 135 mm (11.5 x 13.5 x 5.25").

### VW READOUTS

Compatible readouts include the VW Data Recorder and other pluck-type VW readouts. See separate data sheets for details.

### DATA LOGGERS

DGSI Data Loggers

- VW MiniLogger for 1 Sensor . . . . 52613310
- 4-Channel V-Logger . . . . .52615140
- 8-Channel V-Logger . . . . .52615180

### Campbell Scientific Data Loggers

VW pressure transducers connect directly to the VW MiniLogger, V-Logger and Campbell Scientific CR6. Campbell Scientific CR800 or CR1000 require an AVW200 vibrating wire adapter. See separate data sheets.

### Installation of the Jackout Cell

The jack-out cell is installed in the reinforcing cage, as shown in the drawing above. The signal cable and hydraulic hose are secured, and the cage is lowered into the slurry trench.

When the cage is in position, the jack is activated and locked, forcing the cell into contact with the soil. The jack acts on the support plate, rather than directly on the cell, to prevent distortion of the cell. An equal force is applied to the reaction plate.

The trench is then concreted. In the illustration above, the jack has been activated, and the cell is in contact with the soil. Concrete is being delivered through a tremie pipe and will eventually displace the slurry.

**PNEUMATIC PRESSURE CELLS**

**21 bar (300 psi) Pressure Cell . . . .51408200**

**21bar (300psi) Jackout Cell. . . . .51418200**

Pressure cell has pneumatic pressure transducer attached. Requires pneumatic tubing.

**Range, Resolution and Repeatability:**

Determined by pressure gauge and indicator.

**Fluid:** Ethylene glycol, de-aired to 2 ppm.

**Dimensions:** 230 mm diameter x 11 mm (9 x 0.43"). Transducer adds 300 mm (11.75"). Jackout version has transducer is mounted to center of cell. From sensitive surface to connector end of transducer measures approximately 100 mm (4").

**Weight:** 3.2 kg (7 lb).

**PNEUMATIC TUBING**

**Twin Tubing . . . . .51416900**

Two 4.8 mm (3/16") polyethylene tubes bundled in polyethylene jacket. Rated for 35 bar (500 psi). Nylon tubing can be quoted on request.

**Splice Kit. . . . .51401723**

Includes 3 brass unions, self-vulcanizing mastic pad, and sealing tape.

**Quick Connect Plug . . . . .51407302**

Brass quick-connect fitting for input tube. Plug includes in-line filter and 90° elbow for insertion into panel.

**PNEUMATIC READOUTS**

Compatible readouts include 256 pneumatic indicator. See separate data sheet for features and specifications.

