

Vibrating Wire Piezometers

Applications

VW piezometers are used to monitor pore-water pressure. They can also be used to monitor water levels.

Typical applications include:

- Monitoring pore water pressures to determine safe rates of fill or excavation.
- Monitoring pore water pressures to determine slope stability.
- Monitoring the effects of dewatering systems used for excavations.
- Monitoring the effects of ground improvement systems such as vertical drains and sand drains.
- Monitoring pore pressures to check the performance of earth fill dams and embankments.
- Monitoring pore pressures to check containment systems at land fills and tailings dams.
- Monitoring water levels in stilling basins and weirs.

Operation

The VW piezometer converts water pressure to a frequency signal via a diaphragm, a tensioned steel wire, and an electromagnetic coil.

The piezometer is designed so that a change in pressure on the diaphragm causes a change in tension of the wire. An electro-magnetic coil is used to excite the wire, which then vibrates at its natural frequency. The vibration of the wire in the proximity of the coil generates a frequency signal that is transmitted to the readout device.

The readout or data logger stores the reading in Hz. Calibration factors are then applied to the reading to arrive at a pressure in engineering units.



VW Piezometers: Standard, Low-Pressure, and Push-In (bottom)

Installation Overview

Grout-In Method: The piezometer is lowered to the specified depth, and then the borehole is backfilled with a bentonite-cement grout.

Sand Zone Method: The piezometer is lowered to the specified depth. A sand filter zone is formed around the piezometer. A bentonite plug is placed at the top of the zone, and the remainder of the borehole is grouted.

Embankment Method: The piezometer is embedded in sand or grout and covered with hand-compacted fill. Signal cables are routed through trenches with bentonite water stops.

Push-In Method: The push-in piezometer can be pushed a short distance into soft soil at the bottom of a borehole. The piezometer must be monitored to ensure that it is not overpressured as it is pushed in.

Weirs: The piezometer is fixed to the wall of the weir. In this application, barometric pressure should also be monitored.

Advantages

Groutable: The VW piezometer can be installed without a sand filter zone. This greatly simplifies the installation of multiple piezometers in the same borehole. It also provides a way to install piezometers with inclinometer casing.

High Resolution: VW piezometers provide a resolution of 0.025% of full scale.

High Accuracy: Slope Indicator's automated, precision calibration system ensures that these sensors meet or exceed specifications.

Rapid Response: VW piezometers respond very quickly to small changes in pore-water pressure, whether they are grouted in, pushed into cohesive soils, or embedded in a sand filter zone.

Reliable Signal Transmission: With properly shielded cable, signals from the VW piezometer can be transmitted long distances.



VW PIEZOMETERS

0.7 bar (10 psi) piezometer	52611610
1.8 bar (25 psi) piezometer	52611625
3.5 bar (50 psi) piezometer	52611020
7 bar (100 psi) piezometer	52611030
17 bar (250 psi) piezometer	52611040
35 bar (500 psi) piezometer	52611050

Does not include signal cable. Cable must be ordered at same time as the piezometer.

Sensor Type: Pluck-type vibrating wire sensor with built-in thermistor or RTD.

Range: 3.5, 7, 17, 35 bar (50, 100, 250, 500 psi).
Low-pressure: 0.7, 1.8 bar (10, 25 psi).

Resolution: 0.025%FS.

Accuracy: $\pm 0.1\%$ FS for 0.7, 1.8, 3.5 and 7 bar ranges, $\pm 0.3\%$ FS for 17 and 35 bar ranges.

Maximum Pressure: 1.5 x rated range.

Filter: 50-micron sintered stainless steel.

Temperature Coefficient: $< 0.04\%$ FS per $^{\circ}\text{C}$.

Materials: Stainless steel.

Dimensions: 19 x 195 mm (0.75 x 7.75"),
Low pressure: 29 x 191 mm (1.125 x 7.5").

Weight: 0.16 kg (0.3 lb).

Low-pressure model: 0.45 kg (1 lb).

SIGNAL CABLE

Polyurethane Jacket 50613524
Shielded cable with four 22-gauge tinned-copper conductors and polyurethane jacket.

Universal Connector 57705001
10-pin connector. Not required for terminal box, loggers, or if readings are taken with bare wires.

VW PIEZOMETERS WITH CABLE

3.5 bar (50 psi) piezometers with 15 m (50') cable	52611028
with 30 m (100') cable	52611024
with 45 m (150') cable	52611027
with 60 m (200') cable	52611026

7 bar (100 psi) piezometers with 30 m (100') cable	52611033
with 45 m (150') cable	52611034
with 60 m (200') cable	52611035
with 90 m (300') cable	52611036

INSTALLATION ACCESSORIES

Small Canvas Bag 06240000

Large Canvas Bag 06240001

Provides weight to piezometer and also creates a sand filter around the piezometer tip. Not used with grout-in installations.

Small bag measures 64 x 457 mm (2.5 x 18").
Large bag measures 114 x 457 mm (4.5 x 18").

TERMINAL BOXES



Terminal Box for 6 sensors 57711606

Terminal Box for 12 Sensors 57711600

Terminal Box for 24 Sensors 97711624

Provides terminals for signal cable from 6, 12, or 24 sensors. Sensors are selected by rotary switch. Small 6-sensor box is 240 x 190 x 120 mm (9.5 x 7.5 x 4.75"). Larger 12 and 24-sensor box measures 290 x 345 x 135 mm (11.5 x 13.5 x 5.25").

READOUT

VW Data Recorder 52613500

Jumper Cable for Terminal Box 52613557

The VW Data Recorder displays VW sensor readings in Hz or $\text{H}^2/1000$ and thermistor or RTD data in degrees C. It can also record the readings. See separate datasheet.

The jumper cable is required when the VW Data Recorder is to be connected to a terminal box or to a connector attached to signal cable.

DATA LOGGERS

VW MiniLogger 52613310

The VW MiniLogger is a reliable, low-cost data logger for one sensor. See separate datasheet.

Campbell Scientific Data Loggers

Campbell data loggers with a VW interface and the AM16/32 multiplexer can accommodate 16 piezometers with temperature readings or 32 piezometers without temperature readings.



VW PUSH-IN PIEZOMETER

3.5 bar (50 psi) piezometer 52621020

7 bar (100 psi) piezometer 52621030

17 bar (250 psi) piezometer 52621040

35 bar (500 psi) piezometer 52621050

Part number does not include signal cable. Cable 50613524 is factory-attached piezometer and must be ordered with the piezometer.

Sensor Type: Same as VW piezometer. Only the housing is different. Top of the housing is threaded for a drill rod adaptor, shown below.

Dimensions: 35 x 270 mm (1.375 x 10.5").

Weight: 1.2 kg (2.75 lb).

DRILL-ROD ADAPTORS

EW Adapter Rod 50718042

Optional Accessory. EW adapter rod is 0.6 m (2') long. One end has a right-hand thread to connect to piezometer. The other end has a left-hand thread for easy disconnect from drill rod that is used to push the piezometer into the ground. Order one adapter rod per piezometer, since adapter rod is installed with piezometer.

EW Coupling 50718010

Optional accessory. Coupling (pin) has right-hand thread for drill rod and left-hand thread for easy disconnect from EW adapter rod. Coupling is reused, so only one is required.

