

# 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.



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

## 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.

## Types of VW Piezometers

**Standard:** The standard piezometer is suitable for most applications. It operates equally well in fully-grouted boreholes or sand-filter zones.

**Heavy-Duty:** The heavy-duty model has a strong, double-wall housing and is supplied with armored cable.

**Push-In:** The push-in piezometer has can be pushed a short distance into soft soils using an EW drill rod.

**Multi-Level:** Uses multiple sensors in a single borehole. See separate datasheet.

**Low-Pressure:** This piezometer is designed to monitor very small changes in pore-water pressure.

**Vented:** This piezometer is used to monitor water levels in open stand-pipes and wells. See separate data-sheet.

**Corrosion Resistant:** A titanium body protects against corrosive environments.

## Advantages

**Groutable:** VW piezometers can be installed in fully-grouted boreholes and do not require sand filter zones. This greatly simplifies the installation of multiple sensors in the same borehole. It also makes it possible to install piezometers with inclinometer casing within the same borehole.

**High Resolution:** VW piezometers provide a resolution of 0.025% FS.

**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 changes in pore-water pressure.

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



### STANDARD VW PIEZOMETERS $\text{CE}$

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
Signal Cable . . . . .	.50613824

The standard VW piezometer is suitable for most applications. The piezometer can be installed without a sand filter when the borehole is back-filled with bentonite-cement grout.

### VW PIEZOMETERS WITH CABLE $\text{CE}$

Standard VW Piezometers, 3.5 bar (50 psi) with 15 m (50') cable . . . . .	.52611028
with 30 m (100') cable . . . . .	.52611024
with 45 m (150') cable . . . . .	.52611027
with 60 m (200') cable . . . . .	.52611026

Standard VW Piezometers, 7 bar (100 psi) with 30 m (100') cable . . . . .	.52611033
with 45 m (150') cable . . . . .	.52611034
with 60 m (200') cable . . . . .	.52611035
with 90 m (300') cable . . . . .	.52611036



### PUSH-IN VW PIEZOMETERS $\text{CE}$

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
Signal Cable . . . . .	.50613824
Adapter for EW Drill Rod . . . . .	.50718042
EW Coupling . . . . .	.50718010

The push-in piezometer is a variant of the standard VW piezometer. It has a special housing that allows it to be pushed a short distance into soft, cohesive soils.



### HEAVY-DUTY VW PIEZOMETERS

3.5 bar (50 psi) Piezometer . . . . .	52610520
7 bar (100 psi) Piezometer . . . . .	52610530
17 bar (250 psi) Piezometer . . . . .	52610540
35 bar (500 psi) Piezometer . . . . .	52610550
Signal Cable, Armored . . . . .	50613586

This piezometer features a strong double wall housing and is normally supplied with armored signal cable.



### LOW-PRESSURE VW PIEZOMETERS

0.7 bar (10 psi) Piezometer . . . . .	52611610
1.8 bar (25 psi) Piezometer . . . . .	52611625
Signal Cable . . . . .	50613824

The low-pressure piezometer is designed to monitor very small changes in pore-water pressure. It can also be used to monitor water levels.



### CORROSION-RESISTANT VW PIEZOMETERS

7 bar (100 psi) Piezometer . . . . .	52621230
17 bar (250 psi) Piezometer . . . . .	52621240
Signal Cable . . . . .	50613824

The body of the corrosion-resistant VW piezometer is manufactured of titanium while the filter and diaphragm are protected by a heat-bonded PTFE coating and a PVC housing.

### VW PIEZOMETER SPECIFICATIONS

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

**Range:** Standard ranges are listed at left. Custom calibration ranges are available.

**Resolution:** 0.025%FS.

**Accuracy:**  $\pm 0.1\%$  FS for 0.7 - 7 bar sensors,  $\pm 0.3\%$  FS for 17 and 35 bar sensors.

**Maximum Pressure:** 1.5 x rated range.

**Filter:** 50-micron, sintered stainless steel. A ceramic 1-bar high-air entry filter can be ordered for standard and heavy-duty piezometers by specifying part number 60101240 in addition to the piezometer part number.

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

**Materials:** Stainless steel.

**Size:** Standard: 19 x 195 mm (0.75 x 7.75")  
 Low-Pressure: 29 x 191 mm (1.125 x 7.5")  
 Heavy-Duty: 29 x 191 mm (1.125 x 7.5")  
 Push-In: 35 x 270 mm (1.385 x 10.5")

**Weight:** Standard: 0.16 kg (0.3 lb).  
 Low-pressure: 0.45 kg (1 lb).  
 Heavy-Duty: 0.8 kg (1.75 lb).  
 Push-in: 1.2 kg (2.75 lb).

### SIGNAL CABLE SPECIFICATIONS

**Signal Cable . . . . .** .50613824  
 Shielded cable with four 22-gauge tinned-copper conductors and polyvinyl chloride (PVC) jacket.

**Armored Signal Cable . . . . .** .50613586  
 Shield cable with four 22-gauge tinned-copper conductors, inner polyurethane jacket, steel braid armor, and outer high-density, polyethylene jacket. For heavy duty piezometer only.

### READOUT & TERMINAL BOXES

VW Data Recorder . . . . .	.52613500
Jumper Cable for Terminal Box . . . . .	.52613557
Terminal Box for 6 sensors . . . . .	.57711606
Terminal Box for 12 Sensors . . . . .	.57711600
Terminal Box for 24 Sensors . . . . .	.97711624

See separate datasheet for VW Data Recorder. Terminal boxes provide terminals for 6, 12, or 24 sensors. Sensors are selected by rotary switch. 6-sensor box is 240 x 190 x 120 mm (9.5 x 7.5 x 4.75"). 12 and 24-sensor boxes are 290 x 345 x 135 mm (11.5 x 13.5 x 5.25").

### DATA LOGGERS

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

**Campbell Scientific Data Loggers**

VW piezometers connect directly to the VW MiniLogger and V-Logger. The CR1000 requires an AVW200 vibrating wire adaptor.