SENSEL MONITORING
STRUCTURAL HEALTH MONITORING - WIRELESS SOLUTIONS

W9 STANDARD VIBRATING WIRE PIEZOMETER

Datasheet W9

Description

The Standard Vibrating Wire Piezometer provides accurate measurement of pore water pressures in fully or partially saturated soil.

The transducer is made from high quality 316 grade Stainless Steel and designed to handle pressure ranges from -50 to 4000 kPa. It incorporates an over voltage surge arrestor that offers protection from a lightning strike.

The piezometer may be fitted with either a low air entry sintered steel or high air entry ceramic filters.

A coned nose piece is available for push in installations.

An integral thermistor for temperature monitoring is included.

Features

- **Small diameter**
- **Uses proven Vibrating Wire (VW) technology**
- **Manufactured from high grade 316 Stainless Steel for extended operation**
- **In built temperature compensation**
- **Hermetically sealed**
- **Suitable for long-term monitoring**
- **No electronic components in sensor module**
- **Capable of measuring negative pore pressures to –50 kPa**
- **Fitted with thermistors for temperature monitoring**

Benefits

- **Accurate, repeatable readings over long cable lengths**
- **Long working life, long-term stability and reliability**
- **Fast response to pressure changes**
- **Design prevents case stresses from affecting readings**
- **Over-voltage surge arrestor protects against electrical damage**
- **Connecting cable is strong, screened and flexible**

VIBRATING WIRE PRINCIPLE

VW

A high carbon steel wire is held in tension between a fixed point and a movable point within the sensor.

The physical changes measured by the sensor result in small changes to the position of the movable point which results in a change to the tension of the wire.

The wire may be excited by either plucking or sweeping via a coil adjacent to the wire. The resulting resonant frequency (which is relative to the tension of the wire) is then recorded by the same coil. The reading can be displayed by instrument readout or recorded by data logging equipment.

Operation

The Standard Vibrating Wire Piezometer is designed for the accurate measurement of pore water pressures in fully or partially saturated soil.

The piezometer tip has an integral porous filter element containing a diaphragm type Vibrating Wire pressure transducer. A cable connects the transducer to a read-out, terminal unit or data logger.

The readout displays either frequency based units, or by inputting the instrument calibration factor, engineering units.

Applications

Piezometers are used in geotechnical, environmental, and hydrological applications. They can be installed in boreholes, placed in fill materials or open wells to measure water levels or pore water pressures to enable engineers to verify design assumptions and control placement of fill.

With a nose cone fitted the piezometer can also be pushed into soft ground with a CPT rig.

Typical applications include:

- **Environmental management including landfill sites**
- **Monitoring of aquifers**
- **Monitoring of tidal effects on coastal soils**
- **Dams**
- **Embankments**
- **Potential landslide sites**
- **Dewatering excavations**
- **Tailings lagoons**
- **Pumping tests**
- **Monitoring seepage**
- **Control placement of fill**

THE TECHNICAL RATING FOR THIS PRODUCT: **INTERMEDIATE**

As the correct installation of any monitoring sensor or system is vital to maximise performance and accuracy, Soil Instruments makes the following recommendations, for the skill level of the installation contractor.

ADVANCED	The installer is trained and experienced in the installation of this type of instrument or systems, and is ideally a specialist Instrumentation and Monitoring contractor.
INTERMEDIATE	The installer already has previous experience and/or training in the installation of this instrument or system.
BASIC	As a minimum the installer has read and fully comprehends the manual, and if possible has observed these instruments or systems being installed by others.

Specifications

Sensor

Range (kPa)	300 | 500 | 700 | 1000 | 1500 | 2000 | 4000
Material	316 grade Stainless Steel
Accuracy	±0.1% full scale
Linearity	±0.5% full scale
Resolution[1]	0.025% full scale (minimum)
Over range	200% of full scale
Diaphragm displacement	< 0.001 cm^3
Diameter	19mm
Weight (without cable & filter)	190g
Temperature range	-20° to +80°C
Excitation method	pluck or sweep

Hermetic Sealing

Sensor	Vacuum sealed by electron beam welding
Piezometer	Cable gland / potting compound / "O" ring seals

Thermistor

Type	NTC 3kΩ
Accuracy	0.5°C
Resolution[1]	0.1°C

Filter Types	Ø	Length	Porosity
HAE ceramic	19mm	15mm	1 Micron
Sintered Stainless Steel	19mm	15mm	50 Micron

Cable (with thermistor)

Type	4 Core screened PVC outer sheath
Diameter	7.5mm
Weight /m	73g

[1]Dependent on readout

Ordering information

Low Air Entry Stainless Steel Sintered Filter Vibrating Wire Piezometer

Low resistance to air entry (LAE), stainless steel sintered filter (50micron)

W9-30-SS-T	300kPa pressure range with thermistor
W9-50-SS-T	500kPa pressure range with thermistor
W9-70-SS-T	700kPa pressure range with thermistor
W9-100-SS-T	1000kPa pressure range with thermistor
W9-150-SS-T	1500kPa pressure range with thermistor
W9-200-SS-T	2000kPa pressure range with thermistor
W9-400-SS-T	4000kPa pressure range with thermistor

High air entry ceramic filter vibrating wire piezometer

High resistance to air entry (HAE), ceramic filter (1micron)

W9-30-H-T	300kPa pressure range with thermistor
W9-50-H-T	500kPa pressure range with thermistor
W9-70-H-T	700kPa pressure range with thermistor
W9-100-H-T	1000kPa pressure range with thermistor
W9-150-H-T	1500kPa pressure range with thermistor
W9-200-H-T	2000kPa pressure range with thermistor
W9-400-H-T	4000kPa pressure range with thermistor

Heavy Duty Push-In Piezometers

W9P-30-SS-T	300kPa pressure range
W9P-50-SS-T	500kPa pressure range
W9P-70-SS-T	700kPa pressure range
W9P-100-SS-T	1000kPa pressure range
W9P-150-SS-T	1500kPa pressure range
W9P-200-SS-T	2000kPa pressure range
W9P-400-SS-T	4000kPa pressure range

Connecting Cables and Fittings

CA-2.3-4-SC	4 core, multicore cable, 16/0.020, screened, Priced per metre, PVC jacket, for instruments with thermistors
CA-4.1	Joint sealing kit

Installation Accessories

W9-1.1-27	Push-in stainless steel nose cone, For use with 15mm ceramic and stainless steel filters, 27mm outer diameter
W6-8.1	Punner, To compact material in borehole. For use with W6-8.2 or W1-2.7
W1-2.7	Galvanised standpipe tubing, mild steel galvanised, includes coupling, 1metre length, ¾inch nominal bore, ¾inch BSP thread
W6-8.2	Galvanised standpipe tubing, mild steel galvanised, includes coupling, 3metre length, ¾inch nominal bore, ¾inch BSP thread
W2-4.11	Standard tool kit, tool kit includes: knife, 3 metre measuring tape, 8 inch adjustable spanner, 2 No flat screw drivers, combination pliers, ball hammer, 6 No English spanners 5/16 to 1inch.

Spare Filters

W9-1.3	Replacement ceramic HAE, high resistance to air entry (1micron)
W9-1.4	Replacement sintered steel LAE filter, Low resistance to air entry (50micron)

Manual

MAN-106	Vibrating Wire Standard Piezometer