VIBRATING WIRE PIEZOMETERS

Vibrating wire piezometers are used to monitor pore-water pressure in soils. They are typically sealed in boreholes but can also be embedded in fills, or suspended in a well.

Typical applications include evaluating slope stability, dewatering and drainage schemes, overpressure in silt and clay soils, permeability and hydraulic gradients in dams, and also ground water levels. They can also be used to monitor up-lift pressures in gravity dams.

APPLICATIONS
- Dams and fill embankments
- Measurement of ground water
- Dewatering activities
- Landslides monitoring
- Natural or cut slope sites
- Monitoring of up-lift pressure

FEATURES
- Long-term stability
- Cable length does not affect reading
- Long working life and reliability
- Built-in surge protection (overvoltage)
- Built-in temperature sensor
- Hermetically sealed

Conforme aux exigences essentielles de la Directive CEM 2014/30/UE
VIBRATING WIRE PIEZOMETERS

VW piezometers have a filter tip that prevents small particles of soil from entering the chamber in front of the diaphragm. The pores in the filter allow entry of water, but not particles of soil. This kind of filter is standard with most piezometers and is known as an LAE filter, to distinguish it from an HAE filter. In some environments, the pressure of gas in the soil is higher than the pressure of water. This can adversely affect the accurate measurement of water pressure. In this case, filter with very small pores is required. When the filter is saturated, the surface tension at the pores effectively prevents entry of air, while still allowing entry of water. Air can enter only under very high pressure, thus the filter is known as HAE, High (pressure) Air Entry filter.

Both LAE and HAE filters must be saturated. In the case of the LAE filter, the issue is simply to ensure that there are no air bubbles in the chamber in front of the diaphragm. Such bubbles could slow the response time of the piezometer. In the case of the HAE filter, saturation is required to produce the surface tension effect, and a special saturation device is available for this purpose.

In general, LAE (standard) filters are suitable for most applications. HAE filter should be considered for unsaturated soil where gas pressure might affect the pore-water pressure reading.

FILTER UNITS

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## TECHNICAL SPECIFICATIONS

### STANDARD PIEZOMETERS

**APPLICATION**
Suitable for most applications. Small diameter is convenient for installation in boreholes, standpipes, and observation wells.

**MODEL**

<table>
<thead>
<tr>
<th>Description</th>
<th>PK20S</th>
<th>PK20A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranges (Full scales)</td>
<td>0-170 kPa up to 0-5.0 MPa</td>
<td>0-170 kPa up to 0-5.0 MPa</td>
</tr>
<tr>
<td></td>
<td>0-25 psi up to 0-725 psi</td>
<td>0-25 psi up to 0-725 psi</td>
</tr>
<tr>
<td>Overload</td>
<td>2 x Full Scale</td>
<td>2 x Full Scale</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.025% FS</td>
<td>0.025% FS</td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt; ±0.4% FS</td>
<td>&lt; ±0.4% FS</td>
</tr>
<tr>
<td>Lin. MPE</td>
<td>&lt; ±0.25% FS</td>
<td>&lt; ±0.25% FS</td>
</tr>
<tr>
<td>Pol. MPE</td>
<td>(&lt; ±0.1% FS on request, leaving out 170 kPa FS)</td>
<td>(&lt; ±0.1% FS on request, leaving out 170 kPa FS)</td>
</tr>
<tr>
<td>Typical frequency range</td>
<td>2250 - 3000 Hz</td>
<td>2250 - 3000 Hz</td>
</tr>
<tr>
<td>Thermic zero shift</td>
<td>0.01÷0.03 % FS/°C</td>
<td>0.01÷0.03 % FS/°C</td>
</tr>
<tr>
<td>Electric insulation</td>
<td>&lt; 50 MΩ</td>
<td>&lt; 50 MΩ</td>
</tr>
<tr>
<td>Temp. operating range</td>
<td>-20 to +80 °C</td>
<td>-20 to +80 °C</td>
</tr>
<tr>
<td>Temperature sensor</td>
<td>built-in thermistor</td>
<td>built-in thermistor</td>
</tr>
<tr>
<td>Material</td>
<td>stainless steel</td>
<td>stainless steel</td>
</tr>
<tr>
<td>Diameter and weight</td>
<td>Ø 20 mm (0.8&quot;), 0.4 kg (0.9 lb)</td>
<td>Ø 27 mm (1.1&quot;), 0.5 kg (1.1 lb)</td>
</tr>
</tbody>
</table>

### FILTER UNIT

- **Type**: LAE filter, HAE filter
- **Material**: stainless steel or Vyon®
- **Pore size**: 40-50 μm, 0.25 μm

### CABLE

- **Signal cable**: 0WE104K00ZH (standard LSZH cable)
- **Max cable length to logger**

### HD PIEZOMETERS AND PRESSURE TRANSDUCERS

**APPLICATION**
Heavy Duty HD piezo are recommended for installation in fills and dam embankments and usually supplied with armored cable for good survivability during construction.

**MODEL**

<table>
<thead>
<tr>
<th>Description</th>
<th>PK45S</th>
<th>PK45A</th>
<th>PK45H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranges (Full scales)</td>
<td>0-170 kPa up to 0-5.0 MPa</td>
<td>0-170 kPa up to 0-5.0 MPa</td>
<td>0-350 kPa up to 0-30 MPa</td>
</tr>
<tr>
<td></td>
<td>0-25 psi up to 0-725 psi</td>
<td>0-25 psi up to 0-725 psi</td>
<td>0-50 psi up to 0-4350 psi</td>
</tr>
<tr>
<td>Overload</td>
<td>2 x Full Scale</td>
<td>2 x Full Scale</td>
<td>3-port pipe union</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.025% FS</td>
<td>0.025% FS</td>
<td>with M10x1</td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt; ±0.4% FS</td>
<td>&lt; ±0.4% FS</td>
<td>threaded head</td>
</tr>
<tr>
<td>Lin. MPE</td>
<td>&lt; ±0.25% FS</td>
<td>&lt; ±0.25% FS</td>
<td>(&lt; ±0.1% FS on request, leaving out 170 kPa FS)</td>
</tr>
<tr>
<td>Pol. MPE</td>
<td>(&lt; ±0.1% FS on request, leaving out 170 kPa FS)</td>
<td>(&lt; ±0.1% FS on request, leaving out 170 kPa FS)</td>
<td></td>
</tr>
<tr>
<td>Typical frequency range</td>
<td>2250 - 3000 Hz</td>
<td>2250 - 3000 Hz</td>
<td></td>
</tr>
<tr>
<td>Thermic zero shift</td>
<td>0.01÷0.03 % FS/°C</td>
<td>0.01÷0.03 % FS/°C</td>
<td></td>
</tr>
<tr>
<td>Electric insulation</td>
<td>&lt; 50 MΩ</td>
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<td></td>
</tr>
<tr>
<td>Temp. operating range</td>
<td>-20 to +80 °C</td>
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</tr>
<tr>
<td>Temperature sensor</td>
<td>built-in thermistor</td>
<td>built-in thermistor</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>stainless steel</td>
<td>stainless steel</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**FILTER UNIT**

- **Type**: LAE filter, HAE filter
- **Material**: stainless steel or Vyon®
- **Pore size**: 40-50 μm, 0.25 μm

**CABLE**

- **Signal cable**: 0WE104X20ZH (armoured LSZH cable)
- **Max cable length to logger**: 1000 m (for more information see FAQ#77)

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1. MPE is the Maximum Permitted Error on the measuring range (FSR). In the Calibration Report, the accuracies of the gauge are calculated using both linear regression (≤ Lin. MPE) and polynomial correction (≤ Pol. MPE).
2. The expressed frequency range may vary ± 10%.
3. Refer to FAQ section of Sisgeo website: www.sisgeo.com/faq
PHYSICAL FEATURES

PK20 STANDARD
VW PIEZOMETER

PK45 HEAVY DUTY
VW PIEZOMETER

PK45H PRESSURE
TRANSUDER

M10x1 thread

Vibrating wire piezometer in embankment dam foundation
Uplift pressures are usually monitored by installing a 3-port pipe assembly at the top of a standpipe located in the dam's drainage gallery. The 3-port assembly consists of a 3-port pipe brass union equipped with stainless steel Bourdon gauge manometer, no-vacuum brass valve (2.1 MPa), 2 ball valves and, optionally, a PK45H vibrating wire pressure transducer.

### 3-PORT PIPE UNION

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
<th>Material</th>
<th>Working pressure</th>
<th>Thread for standpipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>0P2RACT2000</td>
<td>brass</td>
<td>12.5 MPa (1813 psi)</td>
<td>G 1/2”</td>
</tr>
</tbody>
</table>

### NO-VACUUM VALVE

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
<th>Availability</th>
<th>Working pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0P2RACV2100</td>
<td>brass</td>
<td>2.1 MPa (305 psi)</td>
</tr>
</tbody>
</table>

### BOURDON MANOMETER

<table>
<thead>
<tr>
<th>PRODUCT CODE</th>
<th>Available ranges</th>
<th>Resolution</th>
<th>Material</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0PMAN100000</td>
<td>0-10 bars, 0-25 bars (0-145 psi up to 0-362 psi)</td>
<td>1% range</td>
<td>Stainless steel and brass</td>
<td>100 mm</td>
</tr>
</tbody>
</table>

### VW PRESSURE TRANSD. PK45H MODEL

<table>
<thead>
<tr>
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<th>Resolution</th>
<th>Material</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK45H</td>
<td>0 - 1 MPa up to 0 - 30 MPa (0-145 psi up to 0-4350 psi)</td>
<td>0.025% range</td>
<td>Stainless steel</td>
<td>27 mm</td>
</tr>
</tbody>
</table>

(1) For more information, refer to page 4

### TYPICAL APPLICATION IN CONCRETE DAM

![Diagram of typical application in concrete dam with 3-port pipe assembly and Bourdon gauge manometer, no-vacuum valve, and ball valve.]
ACCESSORIES AND SPARE PARTS

PROTECTIVE PIEZOMETER CAP
OP100CH1000
Protective cap for standpipe piezometers with data plate and survey pin.

CABLE SPLICING KIT
0EGSM0K0000
Splice kit for lengthening or repairing cable.

BAROMETER
OMEPR106000
Piezoelectric barometer for atmospheric pressure compensation. Range 880-1200 mBar, 4-20 mA output.

PK20 HAE CERAMIC FIL.
OPF20D16000
Spare HAE ceramic filter for PK20 piezometers, pore size 0.25 μm.

PK20 LAE VYON® / STEEL FILTER
OPF20D20000
Spare LAE Vyon® (polyethylene) or sintered steel filter for PK20 piezometers, pore size 40/50 μm.

FILTER SATURATION DEVICE
OPF01SAT000
Stainless steel pump for saturating HAE ceramic filters. Includes pump, 10 bar pressure gauge, and a threaded connection for the filters.

PK45 HAE CERAMIC FIL.
OPF01D16000
Spare HAE ceramic filter for PK45 piezometers, pore size 0.25 μm.

PK45 LAE STEEL FILTER
OPF40D20000
Spare LAE sintered steel filter for PK45 piezometers, pore size 40/50 μm.

PK45 LAE VYON® FILTER
OPF40D2000P
Spare LAE Vyon® (polyethylene) filter for PK45 piezometers, pore size 40/50 μm.

PK20 LAE VYON® / STEEL FILTER
OPF20D20000
Spare LAE Vyon® (polyethylene) filter for PK20 piezometers, pore size 40/50 μm.

PK20 LAE VYON® / STEEL FILTER
OPF20D20000
Spare LAE Vyon® (polyethylene) filter for PK20 piezometers, pore size 40/50 μm.

BENTONITE PELLETS
1000BE20025K
10 mm bentonite pellets supplied in 25 kg bag.

PK20 HAE CERAMIC FIL.
OPF20D16000
Spare HAE ceramic filter for PK20 piezometers, pore size 0.25 μm.

PK45 LAE VYON® FILTER
OPF40D2000P
Spare LAE Vyon® (polyethylene) filter for PK45 piezometers, pore size 40/50 μm.

READABLE BY

CRD

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TECHNICAL ASSISTANCE
SISGEO offers customers e-mail and phone assistance to ensure proper use of instruments and readout and to maximize performance of the system.

For more information, please refer to the FAQ pages on our website or email us: assistance@sisgeo.com