VW PIEZO

VIBRATING WIRE

PIEZOMETERS

PIEZOMETERS

SISGEO®

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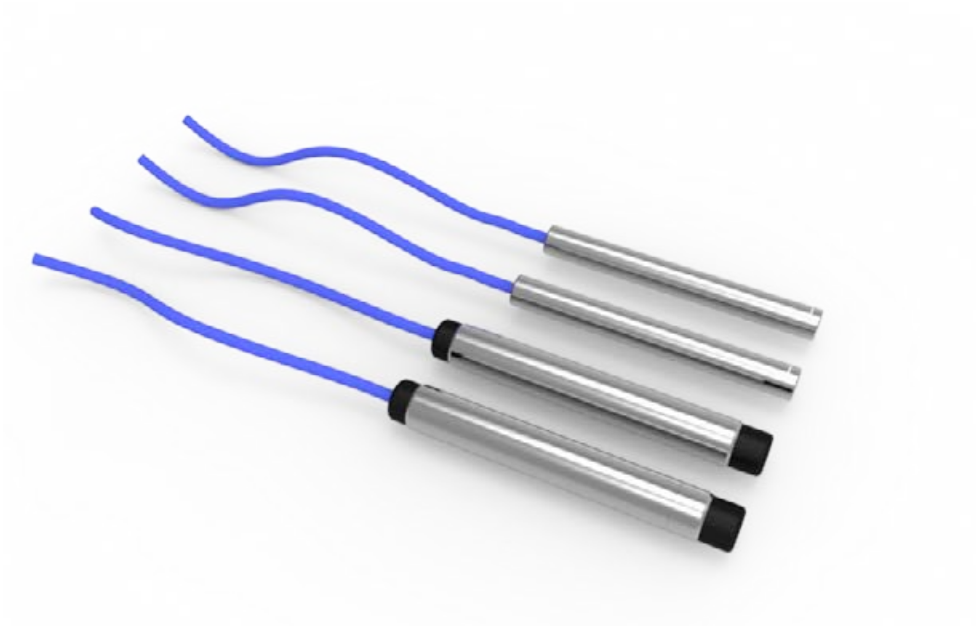


VIBRATING WIRE PIEZOMETERS

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

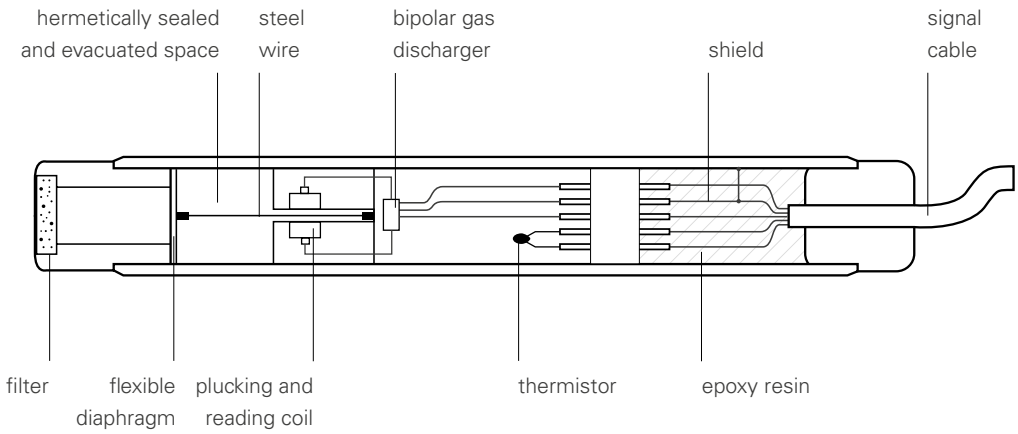
FEATURES

- 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

CE *Conforme aux exigences essentielles de la Directive CEM 2014/30/UE*

WORKING PRINCIPLE

The vibrating wire pressure sensor contains a steel wire held in tension between a flexible outer diaphragm and rigid inner bulkhead. The sensor is configured so that water pressure acting on the diaphram changes the tension in the wire. As pressure increases, tension of the wire decreases, and vice versa. Tension in the wire is measured by setting it into vibration with a series of electromagnetic pulses from a coil. The wire then vibrates primarily at its natural resonant frequency. When excitation ends, the wire continues to vibrate and a sinusoidal signal, at the resonant frequency, is induced in the coil and transmitted to the readout unit. A built-in bipolar gas discharge tube protects the sensor against voltage transients. A built-in thermistor provides temperature data and can be used for thermal corrections.



FILTER UNITS

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 unstaturated soil where gas pressure might affect the pore-water pressure reading.

Saturation of HAE filter with saturation device

TECHNICAL SPECIFICATIONS

	STANDARD PIEZOMETERS		HD PIEZOMETERS AND PRESSURE TRANSDUCERS		
APPLICATION	Suitable for most applications. Small diameter is convenient for installation in boreholes, standpipes, and observations wells.		Heavy Duty HD piezo are recommended for installation in fills and dam embankments and usually supplied with armored cable for good survivability during construction.		3-port pipe union with M10x1 threaded head
MODEL	**PK20S**	**PK20A**	**PK45S**	**PK45A**	**PK45H**
Description	Standard piezo with LAE filter	Standard piezo with HAE filter	HD piezo with LAE filter	HD piezo with HAE filter	pressure transducer
Ranges (Full scales)	0-170 kPa up to 0-5.0 MPa 0-25 psi up to 0-725 psi		0-170 kPa up to 0-5.0 MPa 0-25 psi up to 0-725 psi		0-350 kPa up to 0-30 MPa 0-50 psi up to 0-4350 psi
Overload	2 x Full Scale		2 x Full Scale		
Sensitivity	0.025% FS		0.025% FS		
Accuracy [1] Lin. MPE Pol. MPE	< ±0.4% FS < ±0.25% FS (< ±0.1% FS on request, leaving out 170 kPa FS)		< ±0.4% FS < ±0.25% FS (< ±0.1% FS on request, leaving out 170 kPa FS)		
Typical frequency range [2]	2250 - 3000 Hz		2250 - 3000 Hz		
Thermic zero shift	0.01÷0.03 % FS /°C		0.01÷0.03 % FS /°C		
Electric insulation	< 50 MΩ		< 50 MΩ		
Temp. operating range	-20 to +80 °C		-20 to +80 °C		
Temperature sensor	built-in thermistor		built-in thermistor		
Material	stainless steel		stainless steel		
Diameter and weight	Ø 20 mm (0.8"), 0.4 kg (0.9 lb)		Ø 27 mm (1.1"), 0.5 kg (1.1 lb)		
FILTER UNIT					
Type	LAE filter	HAE filter	LAE filter	HAE filter	-
Material	stainless steel or Vyon®	ceramic	stainless steel or Vyon®	ceramic	-
Pore size	40-50 µm	0.25 µm	40-50 µm	0.25 µm	-
CABLE					
Signal cable	0WE104K00ZH (standard LSZH cable) 0WE104K00PV (standard PVC cable)		0WE104X20ZH (armoured LSZH cable) 0WE104X20PV (armoured PVC cable) 0WE104K00ZH (standard LSZH cable) 0WE104K00PV (standard PVC cable)		
Max cable length to logger [3]	1000 m (for more information see FAQ#77)		1000 m (for more information see FAQ#77)		

(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

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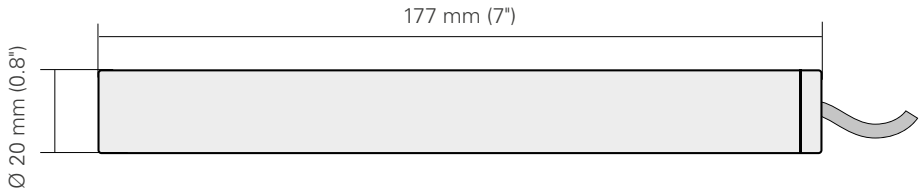
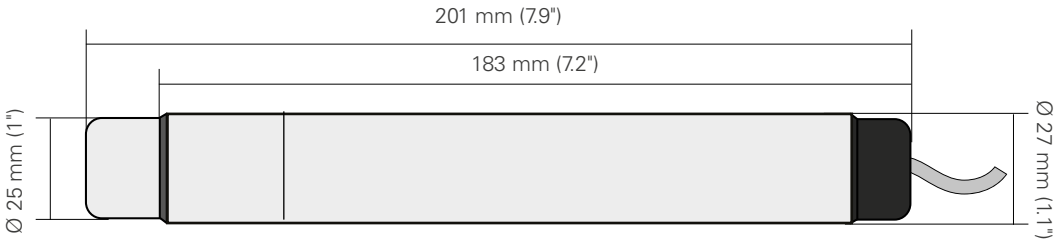
PHYSICAL FEATURES

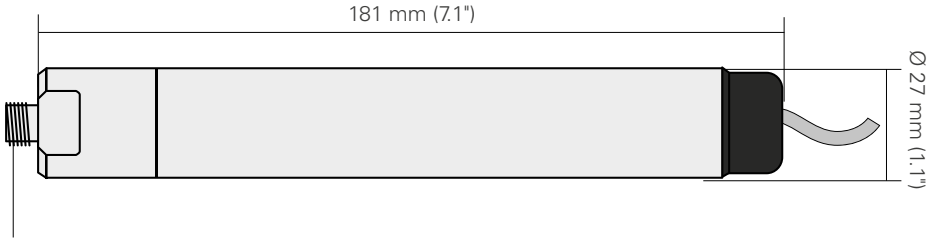
PK20 STANDARD
VW PIEZOMETER



PK45 HEAVY DUTY
VW PIEZOMETER



PK45H PRESSURE
TRANSDUCER



Vibrating wire piezometer in embankment dam foundation

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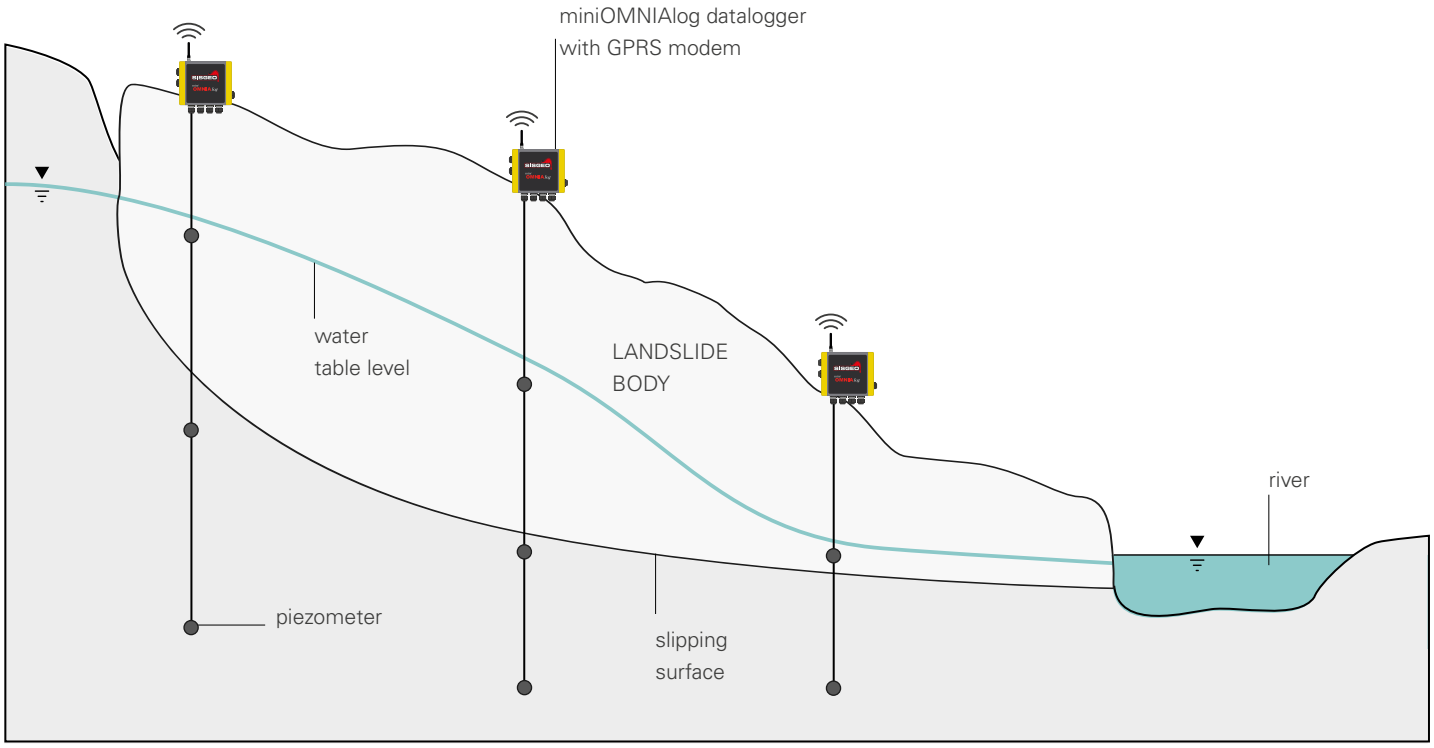
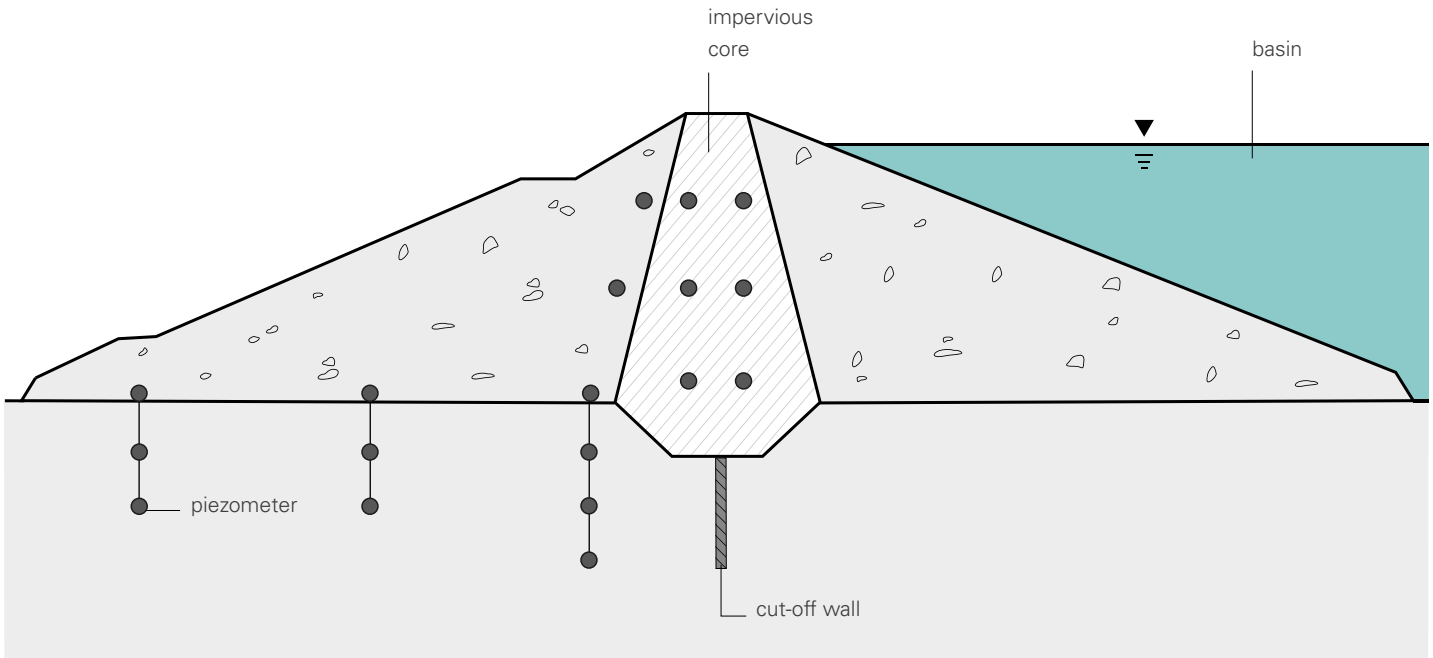
TYPICAL LANDSLIDE APPLICATION



TYPICAL EMBANKMENT DAM APPLICATION



3-PORT PIPE UNION

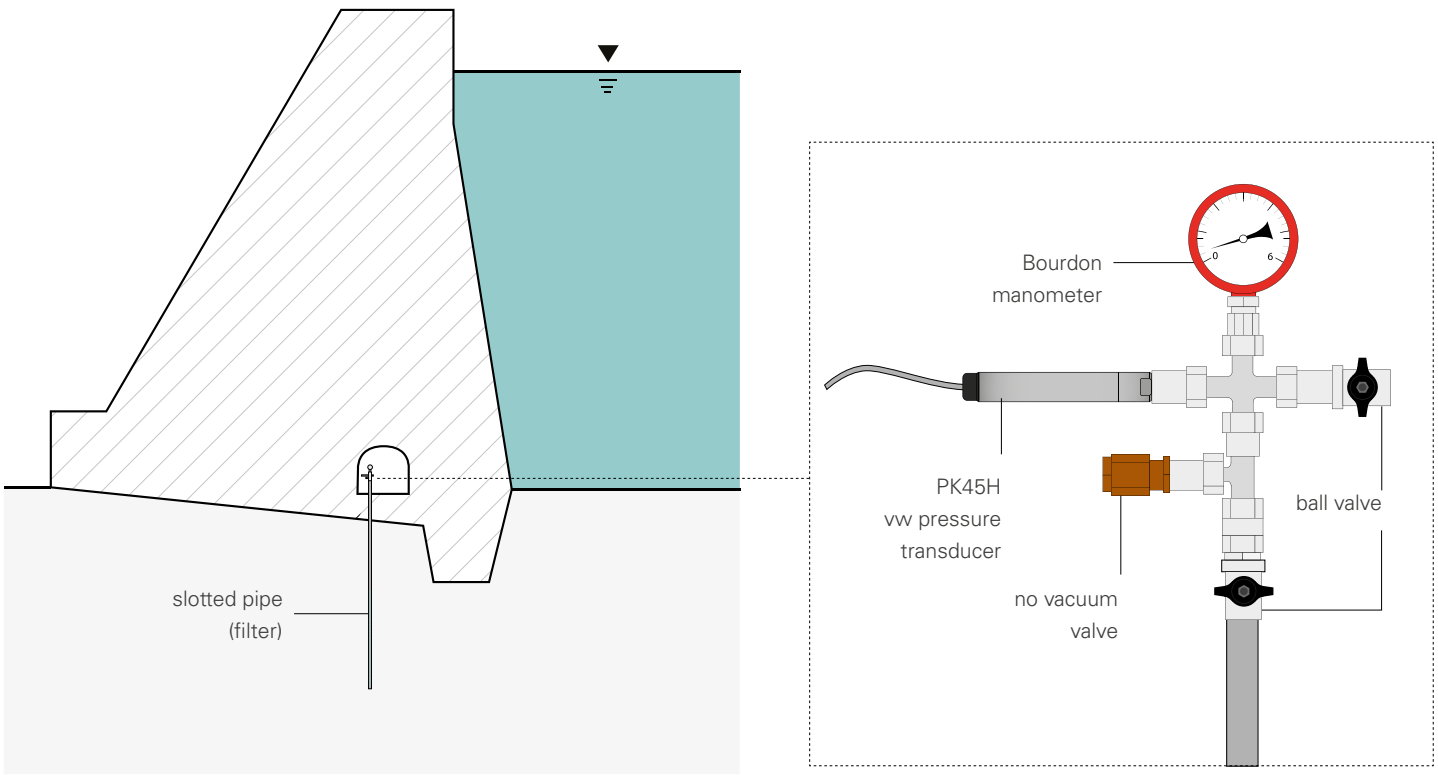
Uplift pressures are usually monitored installing a 3-port pipe assembly at the top of a standpipe located in the dam's drainage gallery. The 3-port assembly consists of a 3-port pipe brass union equipped with stainless steel Bourdon gauge manometer, no-vacuum brass valve (2.1 MPa), 2 ball valves and,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

PRODUCT CODE	3-PORT PIPE UNION 0P2RACT2000	NO-VACUUM VALVE 0P2RACV2100
Material	brass	brass
Working pressure	12.5 MPa (1813 psi)	2.1 MPa (305 psi)
Thread for standpipe	G 1/2"	-

PRODUCT CODE	BOURDON MANOMETER 0PMAN100000	VW PRESSURE TRANSD. PK45H MODEL (1)
Available ranges	0-10 bars, 0-25 bars (0-145 psi up to 0-362 psi)	0 - 1 MPa up to 0 - 30 MPa (0-145 psi up to 0-4350 psi)
Resolution	1% range	0.025% range
Material	Stainless steel and brass	Stainless steel
Diameter	100 mm	27 mm

(1) For more information, refer to page 4

TYPICAL APPLICATION IN CONCRETE DAM



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ACCESSORIES AND SPARE PARTS

PROTECTIVE PIEZOMETER CAP OP100CH1000

Protective cap for standpipe piezometers with data plate and survey pin.

CABLE SPLICING KIT OEGSM0K0000

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

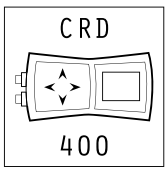
BENTONITE PELLETS 1000BE20025K

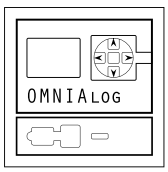
10 mm bentonite pellets supplied in 25 kg bag.

PK45 LAE VYON® FILTER OPF40D2000P

Spare LAE Vyon® (polyetyilene) filter for PK45 piezometers, pore size 40/50 µm.

READABLE BY





Refer to separate datasheets for further information.

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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***