VW PIEZO

VIBRATING WIRE PIEZOMETERS

PIEZOMETERS

SISGEO

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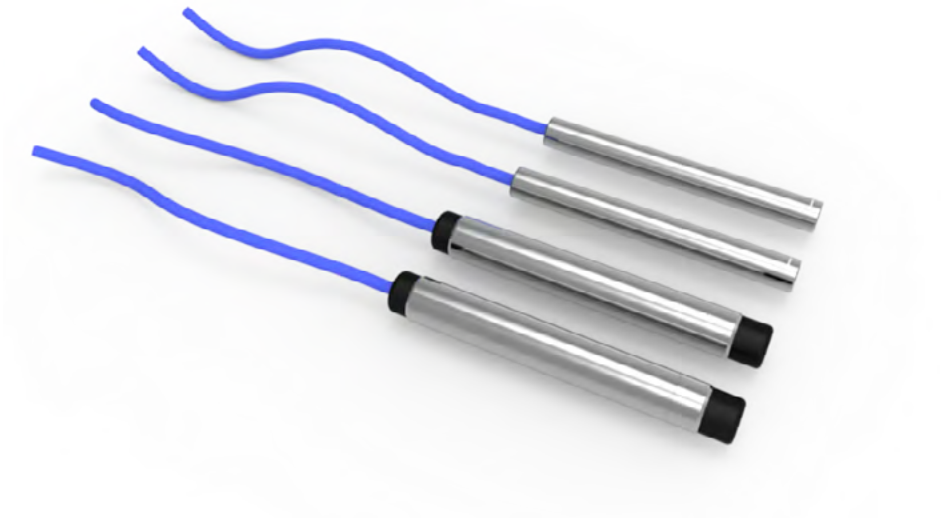


VIBRATING WIRE PIEZOMETERS

Vibrating wire piezometers are designed to measure pore water pressure in soils across various geotechnical monitoring applications. They are commonly installed in sealed boreholes but can also be embedded in fills or embankments, or suspended within wells or standpipe piezometers.
They are absolute (sealed) pressure transducers; in this configuration, the influence of atmospheric pressure should be considered during data processing.
Typical applications include assessing slope stability, monitoring dewatering and drainage systems, evaluating overpressure in silt and clay soils, measuring permeability and hydraulic gradients in dams, and tracking groundwater levels. Additionally, they are suitable for monitoring uplift pressures in gravity dams.

APPLICATIONS

- Dams and fill embankments
- Measurement of groundwater
- Dewatering activities
- Landslides monitoring
- Natural or cut slope
- Monitoring of uplift pressure

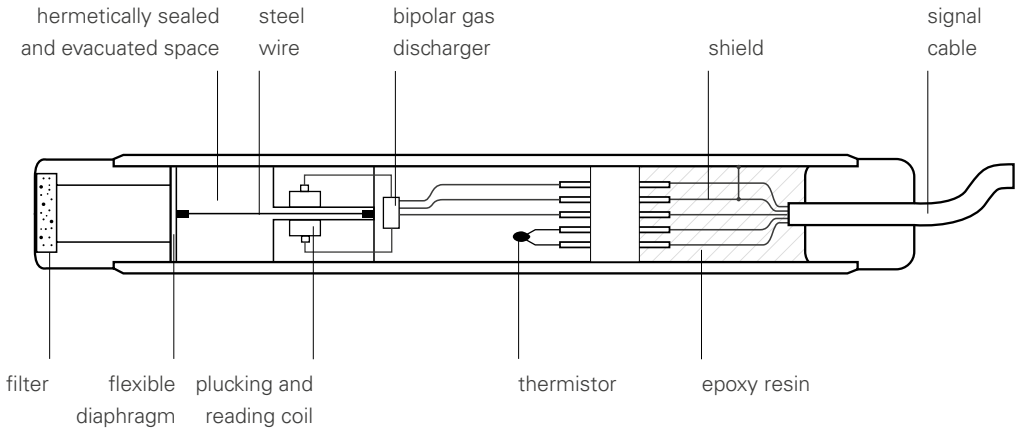
FEATURES

- 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 *Meet the essential requirements of the EMC Directive 2014/30/UE*

WORKING PRINCIPLE

The vibrating wire pressure sensor consists of a steel wire held in tension between a flexible outer diaphragm and a rigid inner bulkhead. The sensor is designed so that water pressure acting on the diaphragm alters the tension in the wire. As the pressure increases, the wire's tension decreases, and vice versa. The wire's tension is measured by inducing vibrations using a series of electromagnetic pulses generated by a coil. Once the excitation stops, the wire vibrates at its natural resonant frequency. This vibration induces a sinusoidal signal in the coil, which is transmitted to the readout unit. The sensor features a built-in bipolar gas discharge tube for protection against voltage transients. Additionally, it includes an integrated thermistor to provide temperature readings, enabling thermal corrections.



FILTER UNITS

VW piezometers are equipped with a filter tip designed to prevent soil particles from entering the chamber in front of the diaphragm. The filter's pores allow water to pass through while blocking soil particles.
This standard filter, commonly used in most piezometers, is referred to as an LAE (Low Air Entry) filter, distinguishing it from an HAE (High Air Entry) filter.
In some environments, the gas pressure in the soil exceeds the water pressure, potentially impacting the accuracy of water pressure measurements. In such cases, a filter with very small pores is required. When saturated, the surface tension at the pores prevents air from entering while still allowing water to pass through. Air can only penetrate under very high pressure, which is why this type of filter is called an HAE filter.
Both LAE and HAE filters must be fully saturated. For the LAE filter, this involves ensuring that no air bubbles remain in the chamber in front of the diaphragm, as such bubbles can slow the piezometer's response time. For the HAE filter, saturation is essential to create the surface tension effect. A specialized saturation device is available for this purpose.
In general, LAE (standard) filters are suitable for most applications. However, HAE filters should be considered for use in unsaturated soils where gas pressure could influence pore water pressure readings.

Saturation of HAE filter with saturation device

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TECHNICAL SPECIFICATIONS

	STANDARD PIEZOMETERS		HD PIEZOMETERS AND PRESSURE TRANSDUCERS		
APPLICATION	Suitable for most geotechnical applications. Small diameter is convenient for installation in boreholes, standpipes, and observation 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
Fully grouted installation compatibility	yes	no	yes	no	N/A
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	See Calibration Report		See Calibration Report		
Resolution	0.025% FS		0.025% FS		
Accuracy (Pol MPE) (1)	< ±0.25% FS (< ±0.1% FS on request, excluding 170 kPa FS)		< ±0.25% FS (< ±0.1% FS on request, excluding 170 kPa FS)		
Typical frequency range (2)	2250 - 3000 Hz		2250 - 3000 Hz		
Thermal zero shift	0.01÷0.03 % FS /°C		0.01÷0.03 % FS /°C		
Electrical insulation	> 50 MΩ		> 50 MΩ		
Operating temperature range	-20 to +80 °C		-20 to +80 °C		
Temperature sensor	built-in thermistor		built-in thermistor		
Material	stainless steel		stainless steel		
IP rate	IP68 (tested up to full-scale pressure)		IP68 (tested up to full-scale pressure)		
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					
Compatible signal cable	0WE104K00PV (standard PVC cable) 0WE104K00ZH (LSZH cable)		0WE104K00PV (standard PVC cable) 0WE104X20PV (standard armoured PVC cable) 0WE104K00ZH (LSZH cable) 0WE104X20ZH (armoured LSZH 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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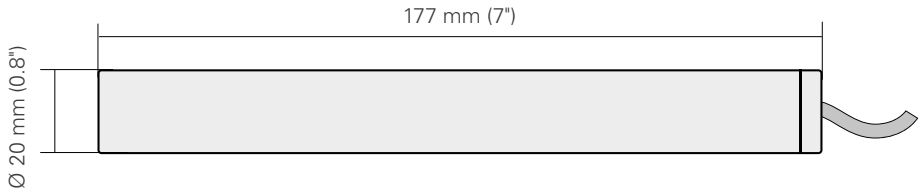
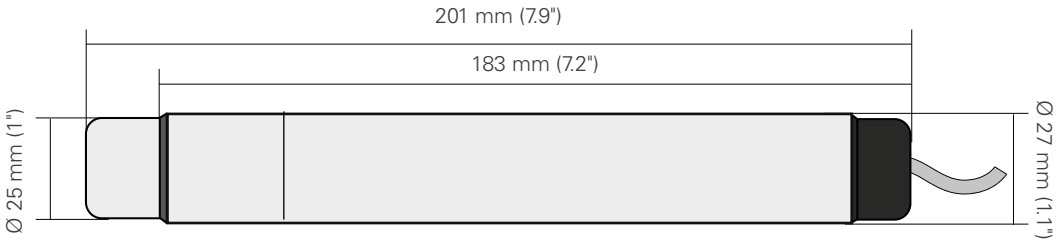
PHYSICAL FEATURES

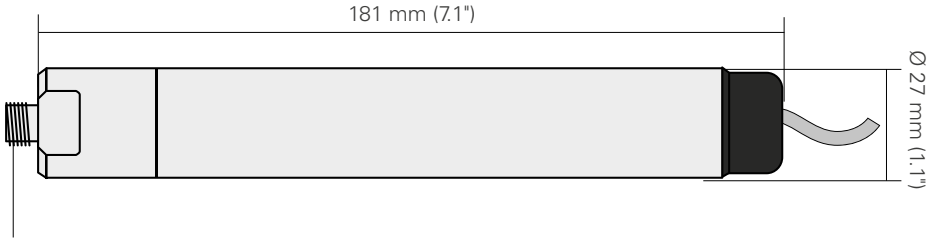
PK20 STANDARD
VW PIEZOMETER



PK45 HEAVY DUTY
VW PIEZOMETER



PK45H PRESSURE
TRANSDUCER



Vibrating wire piezometer in embankment dam foundation

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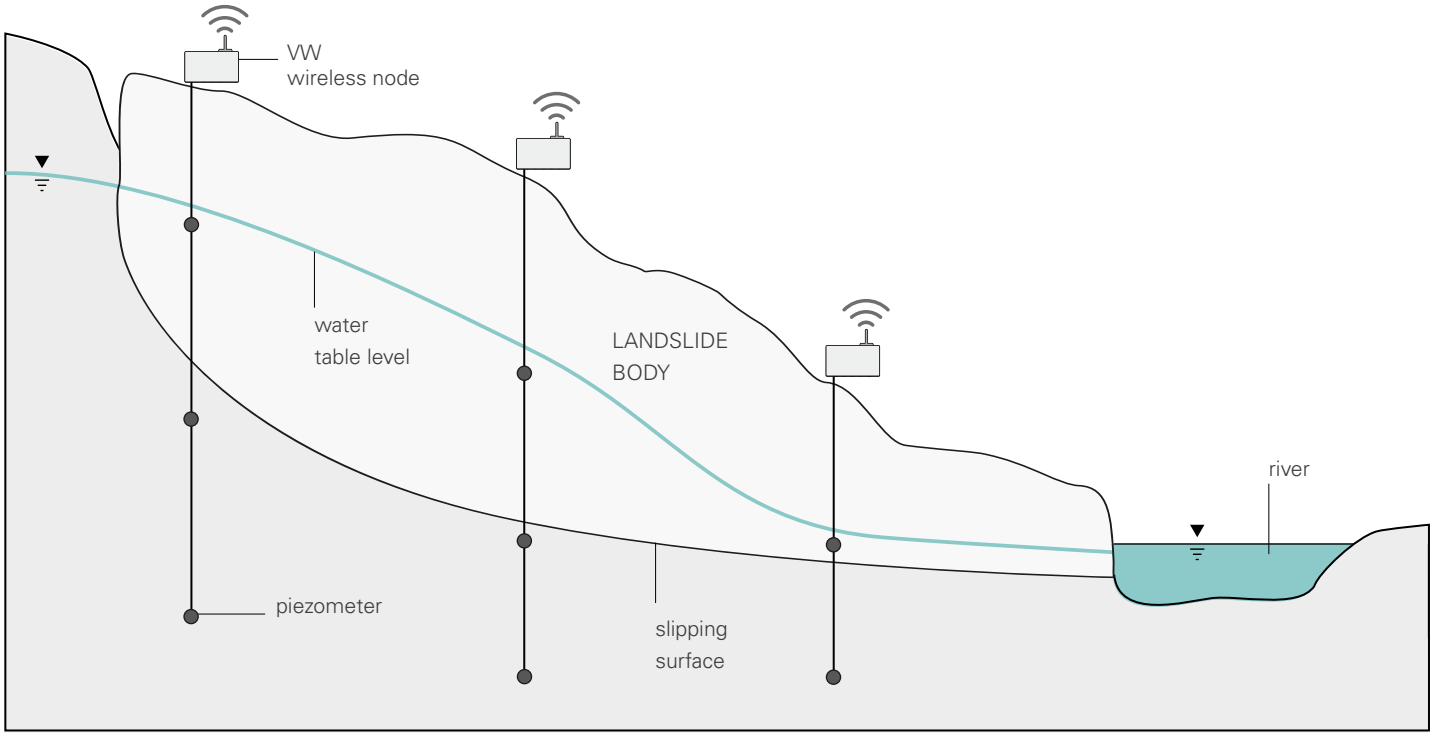
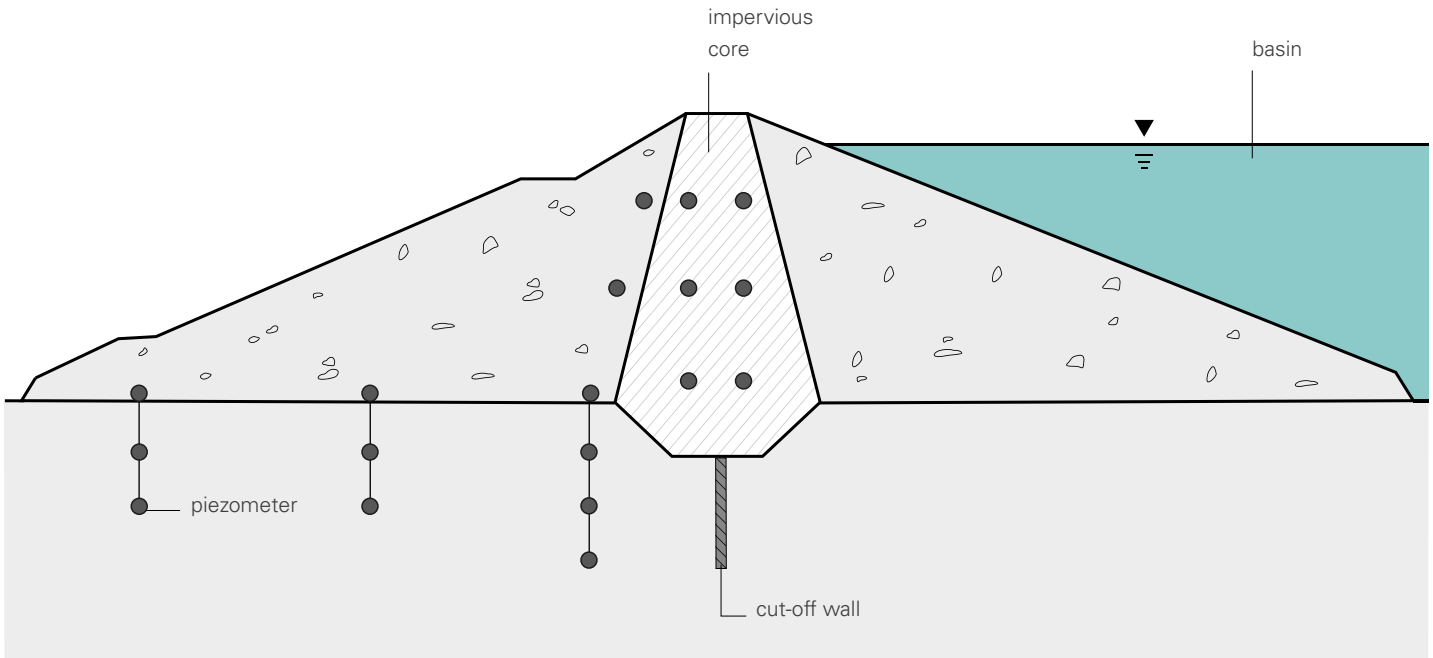
TYPICAL LANDSLIDE APPLICATION



TYPICAL EMBANKMENT DAM APPLICATION



3-PORT PIPE UNION

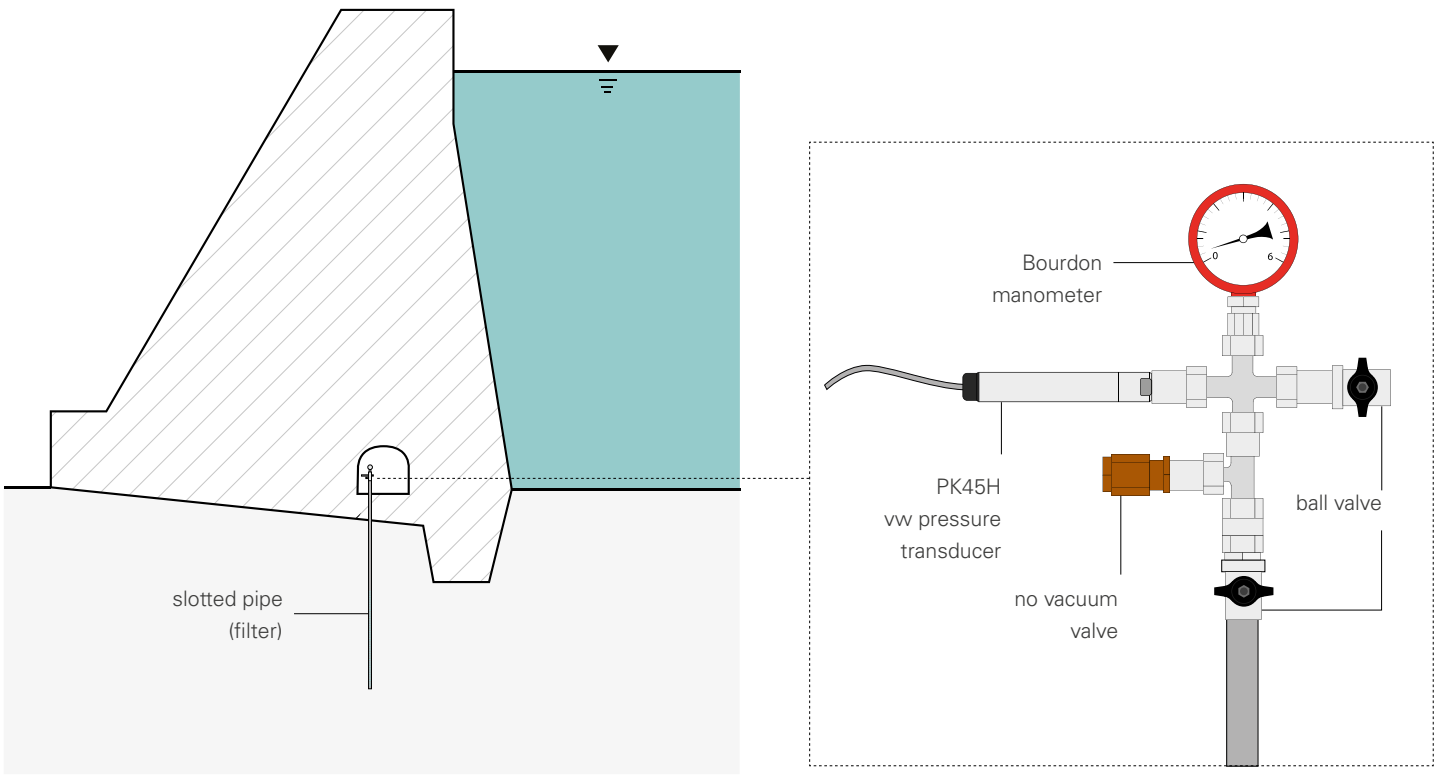
Uplift pressures are usually monitored installing a 3-port pipe assembly at the top of a standpipe located in the dam's drainage gallery. The 3-port assembly consists of a brass 3-port pipe union equipped with stainless steel Bourdon gauge manometer, no-vacuum brass valve (2.1 MPa), 2 ball valves and, 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 - 350 kPa up to 0 - 30 MPa (0-50 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



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.

PK45 FILTER SATURATION DEVICE OPF01SAT000

Stainless steel saturation pump for HAE ceramic filters (PK45 piezometers only). Includes pump unit, 10 bar pressure gauge, and threaded filter connection.

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

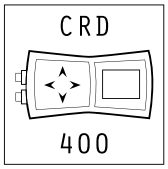
BENTONITE PELLETS 1000BE20025K

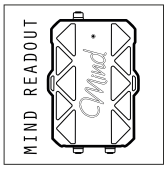
10 mm bentonite pellets supplied in 25 kg bag.

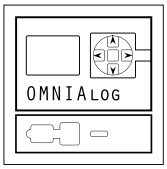
PK45 LAE VYON® FILTER OPF40D2000P

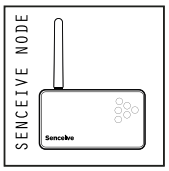
Spare LAE Vyon® (polyethyilene) filter for PK45 piezometers, pore size 40/50 µm.

READABLE BY









For further information refer to readouts datasheets

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