



## PIEZOMETERS AND PRESSURE TRANSDUCERS

Vibrating wire and electrical piezometers are used to measure soil pore pressure or water table level in boreholes.

Applications include control of over-pressure in silt and clay soils, automatic measurement of ground water levels, measurement and control of permeability and monitoring uplift pressure and hydraulic gradients in dams and in natural or cut slopes.

Output signals, suitable for transmission over long distances, are easily read and automated.

The sensor is housed in a small stainless steel sealed body with a porous filter tip. Filters with different porosity are available to suit specific applications.

Hi-Tech sensor component for reliability, fast response and high accuracy

Absolute and vented versions

High accuracy and resolution

Entirely stainless steel construction and hermetically sealed

Output signal suitable for long distance transmission


Readily automated and suitable for long term monitoring



## DRIVE - IN PIEZOMETERS

Either ceramic and vibrating-wire drive-in piezometers, are special versions intended to be pushed directly into soft soil.

If the equipment used to drive the piezometer into the ground can grip and lock on the extension pipe, the piezometer can be pressed directly into the ground. However, if the piezometer is installed by applying a vertical force at the top of the extension pipes, then a slotted adapter is required to prevent damage to the cable.

P235I PK45I	Description	Applications
	<b>Drive-in piezometer</b> Special version for pushing directly in soft soil	Pore pressure monitoring in soft soil



### Over pressure during push-in into soft soil

Sisgeo drive-in piezometer has been designed with conical end tip (40 mm OD) having larger diameter than piezometer body (28 mm OD). For the above the sensor does not have any overpressure problem during the push-in into soft soil.

### Push-in rod

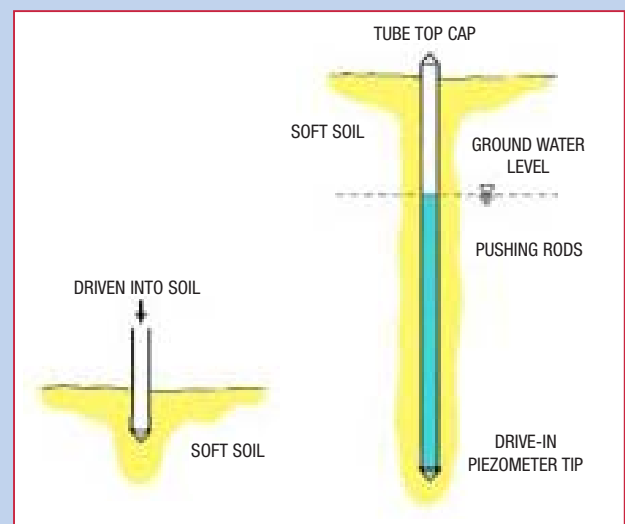
It is a stainless steel 430 mm long tube having 29.1 mm ID and 33.7 mm OD which allow the junction with standard CPT rods. The push-in rod shall be threaded at job site and it must be reused.

### Material

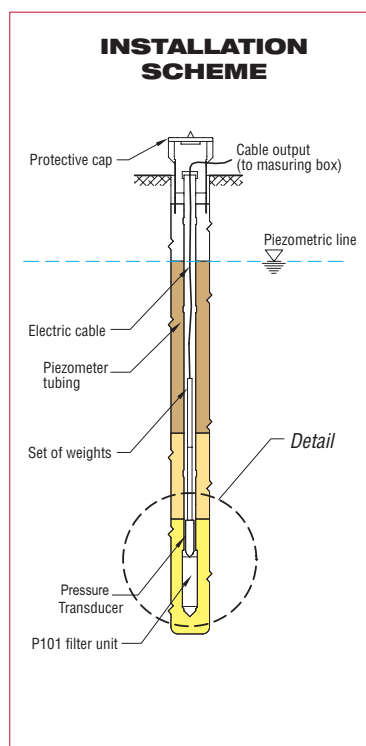
Entirely stainless steel body with conical end tip of 35 mm OD.

### Filter unit

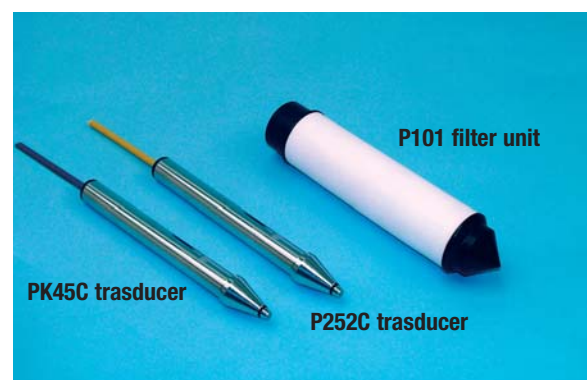
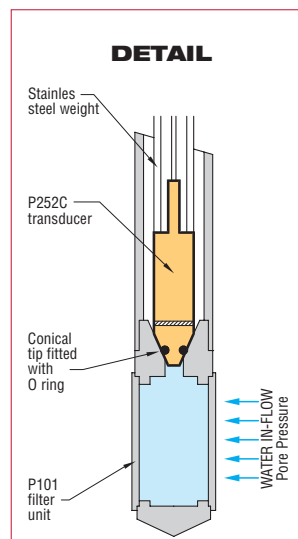
Ceramic high air entry value filter (1 bar and 3 bar available). Filter on request should be saturated at factory or at site by means of saturation device model OPF01SAT000.



## REMOVABLE PORE PRESSURE TRANSDUCER



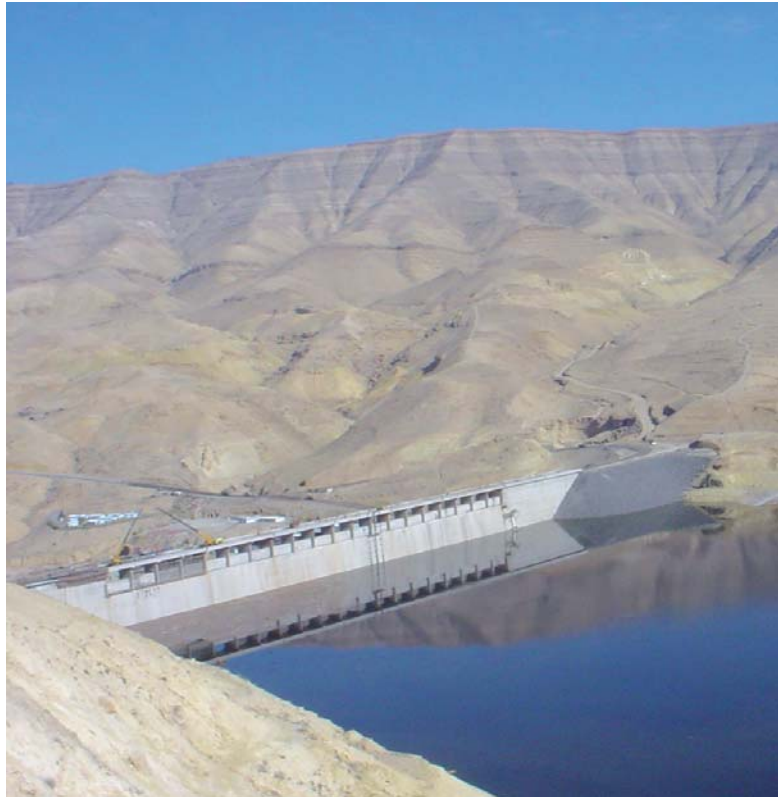
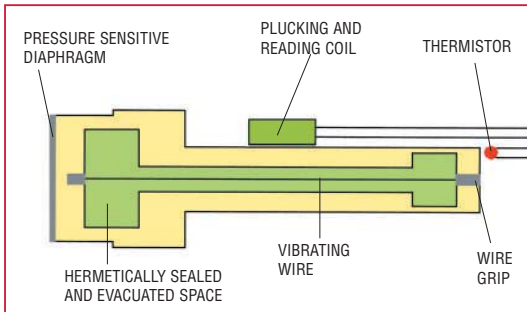
P252C and PK45C are a removable pressure transducers for pore pressure monitoring. They are suitable for long term monitoring as the instrument can be removed for calibration checks, and maintenance or re-used in further boreholes. The sensor is housed in a stainless steel sealed body with a conical tip. The tip, fitted with an 'O' ring, is designed to mate the conical port of the porous filter. Sealing is maintained by ballasting weights inserted into the electric cable. A small orifice at the conical tip allows pore pressure to act on the diaphragm sensor. P101 porous filter unit is normally installed and the transducer is then lowered into the access tube suspended by its own electro-mechanical cable until the piezometer assembly rest on the piezometer. All the transducers can be removed from the borehole by lifting out by means of the electro-mechanical cable.



## VIBRATING WIRE TECHNOLOGY

This sensor has a stainless steel pressure sensitive diaphragm with a tensioned steel wire. The vibrating wire is tensioned inside an hermetically sealed and evacuated space. The water pressure causes a deflection of the diaphragm with a corresponding variation in the tension of the steel wire. The change in tension is measured as a change in the resonant frequency of the wire.

The square of the resonant frequency of the gauge wire is directly proportional to the pressure applied to the diaphragm. Two coils, one with a magnet, another with a pole piece, are located close to the wire. In use, a pulse of varying frequency is applied to the coils and this causes the wire to vibrate primarily at its resonant frequency. When excitation ends, the wire continues to vibrate and a sinusoidal signal, at the resonant frequency, is induced in the coils and transmitted to the readout unit where it is conditioned and displayed.



Mujib Dam - Jordan

## TECHNICAL SPECIFICATIONS

MODEL	PK45S		PK45A		P235S4		P235S1		P252C		PK45C		PK45I		P235I	
Measure	pore pressure				pore pressure				pore pressure				pore pressure			
Type of Sensor	vibrating wire				resistive SG				resistive SG				vibrating wire		resistive SG	
Application	embedded into the soil				embedded into the soil				removable inside P101 tip				drive-in			
Measuring range	350, 700 kPa 1.7, 3.5 MPa				200, 500 kPa 1.0, 2.0, 5.0 MPa				200, 500 kPa		350, 700 kPa		350, 700 kPa 1.7 MPa		200, 500 kPa 1 MPa	
Overload	100% FS				30% FS				30% FS		100% FS		100% FS		30% FS	
Sensitivity	0.025 % FS				0.01% FS				0.01% FS		0.025 % FS		0.025% FS		0.01% FS	
Accuracy (see note)	<0.5% FS				< 0.3% FS				< 0.3% FS		< 0.5% FS		< 0.5% FS		< 0.3% FS	
Thermic zero shift	0.01÷0.03 % FS /°C				0.00025 % FS /°C				0.00025%FS/°C		0.01÷0.03 % FS /°C		0.00025%FS/°C			
Thermic sensitivity shift	< 0.05% FS /°C				< 0.01% /°C				< 0.01% /°C		< 0.05% FS /°C		< 0.05% FS /°C		< 0.01% /°C	
Electric supply	5 ÷ 12 V DC				12 - 24 V DC				12 - 24 V DC		5 ÷ 12 V DC		5 ÷ 12 V DC		12 - 24 V DC	
Output signal	frequency				4 - 20 mA mV/V on request (●)				4 - 20 mA		frequency		frequency		4 - 20 mA	
Electric insulation	4 KV		4KV		4 KV				4 KV		4KV		4VK		4 KV	
Bridge resistance	-		-		15 ± 3 KΩ				15 ± 3 KΩ		-		-		15 ± 3 KΩ	
Temp. operating range	-20 to +100 °C				-10 to +55 °C				-10 to +55 °C		-20 to +100 °C		-20 to +100 °C		-10 to +55 °C	
Temp. sensor	thermistor				-				-		thermistor		thermistor		-	
Material	stainless steel				stainless steel				stainless steel				stainless steel			
Diameter	28 mm				28 mm				28/30 mm				28/35 mm			
Length	200 mm				200 mm				230 mm				260 mm			
Weight	0.5 Kg				0.5 Kg				0.8 Kg				1.0 Kg			
Filter Unit																
Material	sinterised s/steel		ceramic		sinterised s/steel		ceramic		sinterised s/steel				ceramic			
	vjon		HAE value		vjon		HAE value		vjon				HAE value			
Diameter (OD)	disc 18 mm		disc 15 mm		disc 18 mm		disc 15 mm		stone 4 mm				disc 15 mm			
Pore size	40/50 micron		0,25micron		40/50 micron		0,25micron		40/50 micron				0,25 micron			
Cables																
Model	WE104VWK WE104X02(*)				WE102KEO(+)		WE102KEO(+)		W102KEO(+)		WE104VWK WE104X02(*)		WE104VWK WE104X02(*)		WE102KEO(+)	
N° of conductors	2 pairs (4)				2		2		2		2 pairs (4)		2 pairs (4)		2	
Remarks:	(*) armoured with stainless steel sheath (+) Kevlar stress member (●) WE207KEO vented cable (6 conductors+atm. tubing)															

## TECHNICAL SPECIFICATIONS

MODEL	P252R	PK45H	P252A
Measure	Water Table	Water Pressure	Water Pressure
Type of Sensor	Resistive SG	Vibrating Wire	Resistive SG
Application	within standpipe	3-port assembly/pressure cells/NATM	
Measuring range	100, 200, 500 kPa	350, 700 kPa 1.7, 3.5, 7.0 MPa	200, 500 kPa 1.0, 2.0, 5.0, 10, 20 MPa
Overload	30% FS	100% FS	30% FS
Sensitivity	0,01 % FS	0,025% FS	0.01% FS
Accuracy (see note)	<0.2% FS	< 0.5% FS	< 0.3% FS
Thermic zero shift	0.00025 % FS /°C	0.01÷0.03 % FS /°C	0.00025 % FS /°C
Thermic sensitivity shift	< 0.01%FS /°C	< 0.05% /°C	< 0.01% /°C
Electric supply	12 - 24 V DC	-	12 - 24 V DC
Output signal	4 - 20 mA mV/V on request (•)	frequency	4 - 20 mA mV/V on request (•)
Electric insulation	4 KV	4KV	4 KV
Bridge resistance	15 ± 3 KΩ	-	15 ± 3 KΩ
Temp. operating range	-10 to +55 °C	-20 to +100 °C	-10 to +55 °C
Temp. sensor	-	thermistor	-
Material	stainless steel	stainless steel	stainless steel
Diameter	28 mm	28 mm	28 mm
Length	200 mm	180 mm	180 mm
Weight	0.6 Kg	0.6 Kg	0.6 Kg
<b>Filter unit</b>			
Material	sinterised s/steel vjon	-	-
Diameter (OD)	disc 20 mm	-	-
Pore size	40/50 micron	-	-
<b>Cables</b>			
Model	WE203KEO (+)	WE104VWK WE104X02(*)	WE102KEO(+)
Number of conductors	2 + atm. tube	2 pairs (4)	2

**Remarks:** (\*) armoured with stainless steel sheath (+) Kevlar stress member (•) WE207KEO vented cable (6 conductors+atm. tubing)

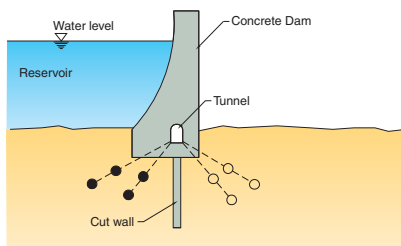
CE electromagnetic compatibility according to EN 61326-1 and EN 61326-A1 directives for EMC emission and immunity

**Note:** Accuracy quoted is on the basis of a straight line relationship between applied pressure and electrical response, calculated using least mean squares regression techniques. This assumed relationship is normally acceptable for most purposes. In reality, however, the relationship is not strictly linear and so we give precision calibration factor which allows for second order parameter equation. These additional calibration factors considerably enhance the stated accuracy.



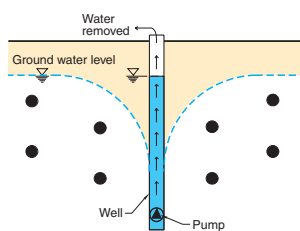
## APPLICATIONS

### CONCRETE DAMS



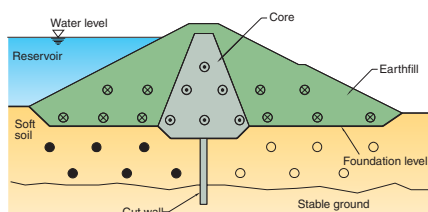
- TO CONTROL:
- ○ COMPACTION OF SOIL UNDER FOUNDATION
  - ○ PLACEMENT OF FILL
  - ○ UPLIFT PRESSURE
  - ○ CORE PORE PRESSURE
- TO MONITOR:
- ○ UPLIFT PRESSURE
  - ○ SEEPAGE

### PUMPING TESTS

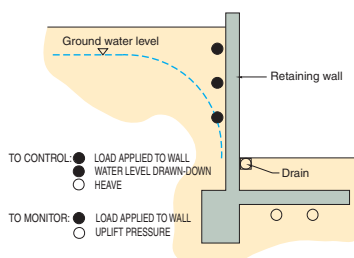


- TO CONTROL:
- PUMPING SCHEME
  - FLOODING
- TO MONITOR:
- WATER LEVEL DRAW-DOWN

### EARTH FILL DAMS



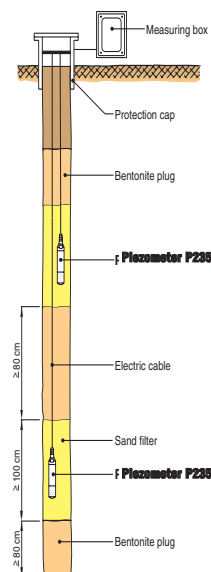
### RETAINING WALLS



- TO CONTROL:
- LOAD APPLIED TO WALL
  - WATER LEVEL DRAW-DOWN
  - HEAVE
- TO MONITOR:
- LOAD APPLIED TO WALL
  - UPLIFT PRESSURE

## INSTALLATIONS

### BOREHOLE



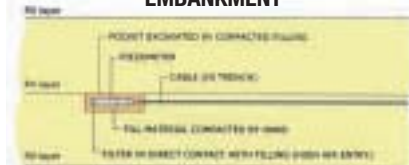
Piezometer is inserted at set depth into a borehole. A 1 m thick sand filter is installed around piezometer. Water from the surrounding soil passes through the filter loading the sensor.

Two bentonite plugs are installed above and beneath the filter section.

Additional piezometer should be installed in the same borehole.

Output signal is transmitted by electric cable to the readout unit.

### EMBANKMENT





## PRESSURE TRANSDUCERS

### P252A



#### Description

**Absolute pressure transducer.**  
Threaded to provide a pressure tight sealed connection

#### Applications

Fluid pressure in pipes and on 3-ports assembly.  
Hydraulic pressure cells.

### P252R



**Vented pressure transducer.**  
Suitable for immersion in standpipes, wells or Casagrande piezometers

Ground water level monitoring.

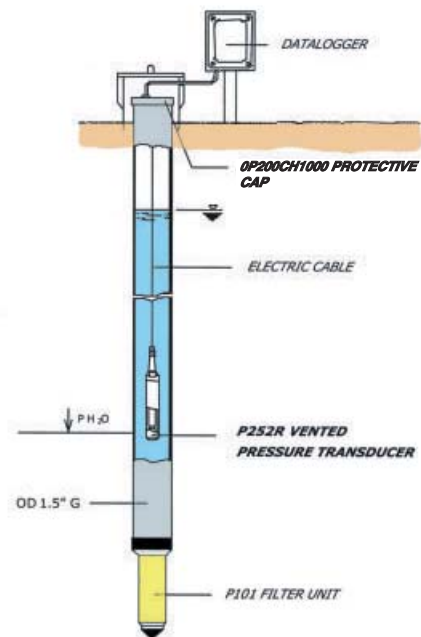
### PK45H



**Unvented pressure gauge.**  
Threaded to provide a pressure tight sealed connection

Fluid pressure in pipes and on 3-ports assembly,  
Hydraulic pressure cells.

## GROUND WATER LEVEL MONITORING



### OP200CH1000 Protective cap

Usually installed at the top of the piezometer tube to protect the tubing and to secure support to the suspended transducer. Equipped with identification plate and topographic pin it can be opened allowing the maintenance of the transducer.

## 3-PORT PIPE UNION



From the drainage gallery in the dam body, the up-lift water pressures are usually monitored installing a 3-ports assembly on the top of stand pipe.

The 3-ports assembly consists of a 3-ports pipe brass union (2,0 MPa) equipped with stainless steel Bourdon gauge manometer, no-vacuum valve brass made (2,1 MPa), 2 brass valves and, optionally, with electrical or vibrating wire pressure transducer.

## PIEZOMETER COMPARISON TABLE

Piezometer type	Advantages	Limitations
<b>STANDPIPE AND CASAGRANDE</b>	<ul style="list-style-type: none"> <li>- Simple and reliable</li> <li>- Low cost</li> <li>- Allows permeability testing</li> </ul>	<ul style="list-style-type: none"> <li>- Hydro-dynamic time lag in low permeability soils</li> <li>- Manual readings can be automated using electrical transducers</li> <li>- Suffer damage from construction activities</li> </ul>
<b>PNEUMATIC PIEZOMETERS</b>	<ul style="list-style-type: none"> <li>- Rugged and reliable</li> <li>- Fast response times</li> <li>- No long term drift and null balance calibration principles</li> <li>- Unaffected by frost</li> <li>- Cheaper than electrical piezometers</li> </ul>	<ul style="list-style-type: none"> <li>- Long tubing lengths can decrease response and accuracy</li> <li>- Automation is difficult and requires electro/pneumatic controls</li> <li>- Compressed gas supply required</li> </ul>
<b>ELECTRICAL PIEZOMETERS</b>	<ul style="list-style-type: none"> <li>- Fast response and high accuracy</li> <li>- Suitable for dynamic measurements</li> <li>- Easy to read and readily automated</li> </ul>	<ul style="list-style-type: none"> <li>- Not recommended for long-term monitoring</li> <li>- Often inaccessible after installation</li> <li>- Calibration checks not possible after installation</li> </ul>
<b>REMOVABLE PORE PRESSURE TRANSDUCERS</b>	<ul style="list-style-type: none"> <li>- Reusable</li> <li>- Calibration readily checked</li> <li>- Easily automated</li> <li>- Negligible hydro-dynamic time lag in low permeability soils</li> </ul>	<ul style="list-style-type: none"> <li>- Pressure range limited to 500 kPa</li> <li>- Standpipe tubing required</li> <li>- High cost</li> </ul>
<b>VIBRATING WIRE PIEZOMETERS</b>	<ul style="list-style-type: none"> <li>- Long term stability</li> <li>- Fast response</li> <li>- Long distance transmission</li> <li>- Easily automated</li> <li>- Immunity to voltage surges (lightning)</li> </ul>	<ul style="list-style-type: none"> <li>- Poor accuracy at low pressures</li> <li>- Temperature measurements required</li> <li>- Not suitable for high speed continuous measurements</li> </ul>

# PIEZOMETERS

## FILTER UNITS AND SATURATION DEVICE

The filters are available with different porosity and air entry value to suit the specific conditions of use. The filter porosity and the fluid used determines the air entry value. Filters are usually saturated in boiled water.

For the saturation of HAE value filter (ceramic), SISGEO provides a device consisting of a stainless steel pump with manometer and a threaded port for the connection with the filter unit.

<b>OPF01SAT000</b>	Saturation device for HAE filter
<b>OPF01D16000</b>	HAE ceramic filter 0,25 micron, 100kPa, OD 15 mm.
<b>OPF40D20000</b>	LAE synerized s/steel disc, 40 micron, OD 18 mm.
<b>OPF40D20000</b>	LAE synerized HDPE (vjon) disc, 40 micron, OD 18 mm.



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## LATEST REFERENCE PROJECTS (vibrating wire piezometers)

Year	Project	Client	Installed piezometers
2007	Central Fabricio Ojeda, Venezuela	Cadafé	16
2007	Azadi Dam, I.R. of Iran	Sad Afzar	110
2006-07	Mazar Hydroelectric Project, Ecuador	Asociacion Masar	30
2006-07	Atasu Dam, Turkey	STT Elektronik Kontrol Ltd.	11
2006-07	Wadi Itwad Dam, Saudi Arabia	Envirotec International Co. Ltd.	23
2006-07	Kamal Saleh Dam, I.R. of Iran	Poornam Construction Co.	46
2006	Vidraru Dam, Romania	CSR SRL	14
2005	Sureyya Bey Dam, Turkey	Kiska-Eren-Ecetur	33
2004-06	Guarara Dam, Nigeria	Salini Nigeria LTD	79
2004-05	Bordesecco Dam, Venezuela	Trevi S.p.a.	61
2004-05	Ilarionas Dam, Greece	Aegek - Meton JV	70
2004-05	Molasadra Dam, I.R. of Iran	Melli Sakhteman Co.	47
2004	Tangab Dam, I.R. of Iran	Fars Water Authorities	21
2003-07	Karahnjukar Hydroelectric Project Iceland	Impregilo Spa	33
2000-07	Salman E Farsi Dam, I.R. of Iran	FARS Water Authorities	25
2001-04	Val Clarea Basin, Italy	Pont Ventoux s.c.a.r.l.	83
2000-03	Mujib Dam, Jordan	Aegek-Hidrogradnja J/V	22



Vidraru Dam - Romania

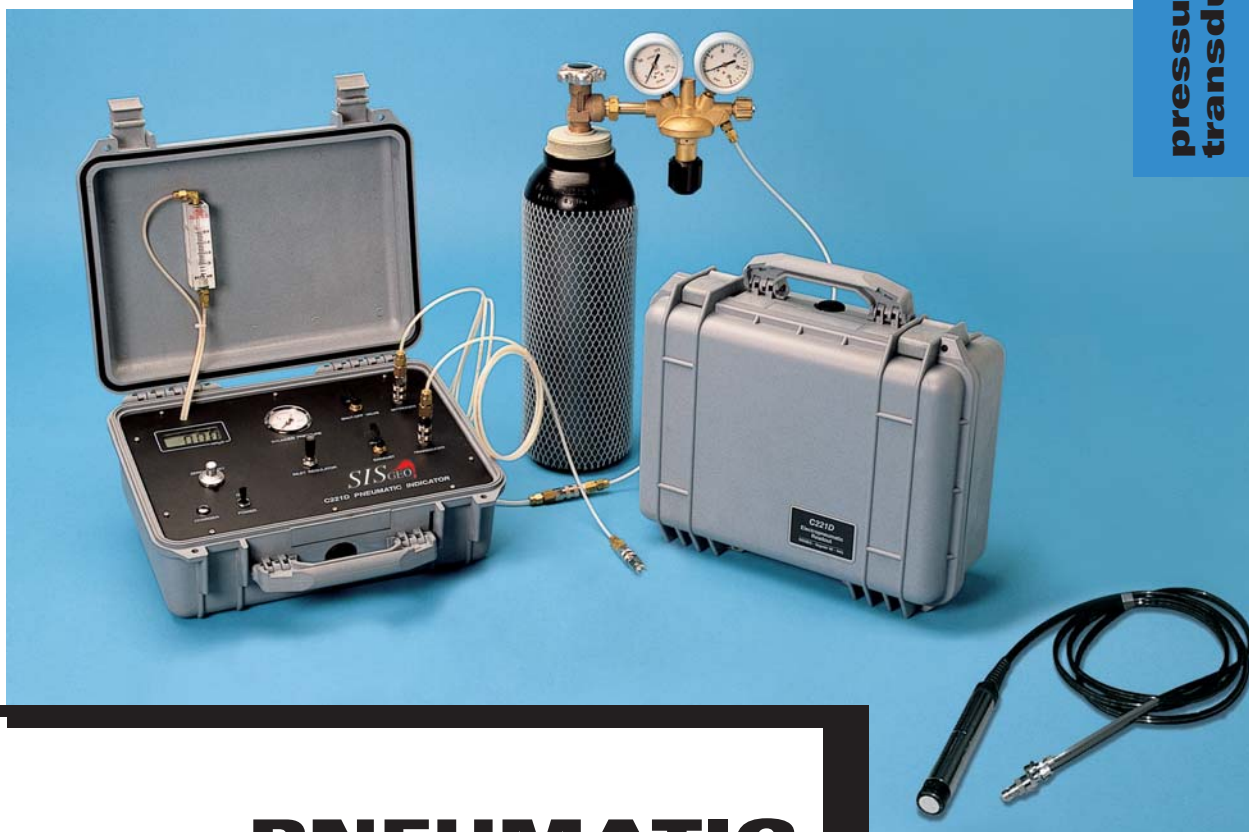


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PIEZO\_EN - REV. 02 - 10/07



## PNEUMATIC PIEZOMETERS

Rugged, reliable and unaffected by frost, the pneumatic piezometer permits water pressure monitoring in permeable soil.

The piezometer transducer consists of a stainless steel body equipped with porous stone and rubber diaphragm connected to a pair of flexible tubes in a common PE jacket.

Piezometer operation requires a supply of pressurized inert gas (dry nitrogen). Water pressure is balanced with pneumatic pressure supplied from the gas cylinder, adjusted through the readout unit.

Water pressure measurement is displayed directly in KPa on the LCD of Sisgeo pneumatic indicator.

Reliable, frost resistant,  
robust and low cost

No electrical components  
below ground

Long life for permanent  
installation

Unaffected by lightning

Responds to rapid  
change in pore pressure

Digital readout convenient  
and easy to use

# PNEUMATIC PIEZOMETERS

## ACCESSORIES AND SPARE PARTS

<b>OECAVP02F00</b>	Pneumatic readout jumper cable for connecting the readout to terminal box or to transducer tubing. 2 m jumper tubing with female quick-connect fittings at each end
<b>OEPCP000000</b>	Multiple terminal box for taking measurements from several pneumatic piezometers. The piezometer tubes are connected directly to a multiple measuring box. The terminal box consists of a plastic enclosure with a quick male connector for each transducer fitted on its front panel. Terminal box provides a quick and easy method of switching connections between piezometers
<b>OEPCP000800</b>	Plastic enclosure for up to 8 transducers, size 210 x 165 x 90 mm
<b>OEPCP001600</b>	Plastic enclosure for up to 16 transducers, size 270 x 245 x 120 mm
<b>OEPCP002400</b>	Plastic enclosure for up to 24 transducers, size 270 x 245 x 120 mm
<b>OEPCP00ST00</b>	Male quick connector for each channel (transducer)

## TECHNICAL SPECIFICATIONS

### PIEZOMETER TRANSDUCER MODEL OP211020000

The transducer consists of a stainless steel body equipped with a rubber diaphragm, connected to a pair of flexible tubes.

The piezometer has compression fitting for convenient field-attachment of tubing and sinterized steel or vjon filter, as required.

Diaphragm displacement	0.1 cc
Sensitivity	± 0.01% FS
Accuracy	equal to readout
Diameter	25 mm
Length	145 mm
Diaphragm	silicon rubber
Maximum pressure	2 MPa (200 meter water column) 1 MPa = approximately 10 Bar
Weight	0.15 Kg

### SISGEO PNEUMATIC INDICATOR

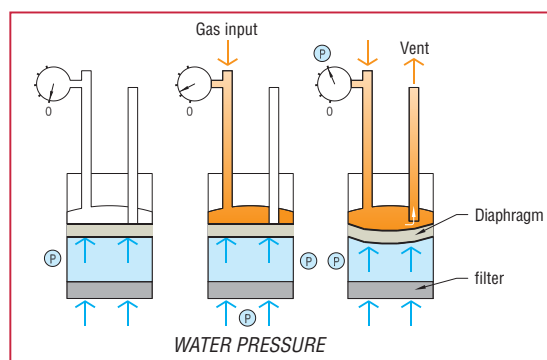
The unit incorporates a pressure transducer with digital readout. The readout unit provides suitable connection ports for tubes to the transducer and inert gas cylinder (gas cylinder is supplied with the readout unit). Coarse and fine adjustment pressure regulators and a balance pressure indicator are included. It is powered by a rechargeable battery.

Model	OC221DP2000
Measuring range	2 MPa (200 m water column)
Digital display	3.5 digit LCD
Readout resolution	0.01% FS (10 cm water column)
Reading accuracy	± 0.1% FS
Battery life (fully charged)	Approximately 8 hours
Operating temperature	-20°C +60°C
Gas tank	External cylinder 5 litre capacity
Recommended gas	Dry nitrogen
Size	400 x 320 x 175 mm
Weight	4.5 Kg (without nitrogen cylinder)

## PNEUMATIC TUBING AND FITTINGS

<b>OWP502R0200</b>	Pneumatic tubing consisting of two nylon tubes in a common jacket. Tubing size: 2 mm ID with 1 mm wall. Polyurethane jacket: 10 x 5 mm
<b>OECP004MV00</b>	Pneumatic quick connector for input tube. The connector includes an in-line filter and quick coupling for insertion into the readout jumper cable
<b>OECP020400</b>	Pneumatic cable straight coupling consisting of a pair of 2/4 mm brass unions, self-vulcanising mastic pad and sealing tape

### WORKING DIAGRAM



To take measurements the pneumatic tubes from the transducer are connected to the readout unit using the readout jumper cable. The water pressure is balanced with pneumatic pressure from the nitrogen cylinder adjusted through the readout unit. The balance gas pressure/water pressure is displayed on the pneumatic indicator.



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## **CASAGRANDE AND STANDPIPE PIEZOMETERS**

Casagrande filter unit is used to measure the water pressure in permeable soil. Filter unit is made in syntherised high density polyethylene. It is available in different models to suite all the customer applications. Filter units have threaded cap joint with two 0.5" twin tubes or with a 1.5" single tube.

Standpipe piezometers are used to monitor the ground water table. The standpipe filter unit consists of a slotted tube covered by geotechnical fabric for filtered water entry.

Stainless steel push-in filter unit is also available for drive-in piezometer installation in soft soils.

Control of ground water level in soil

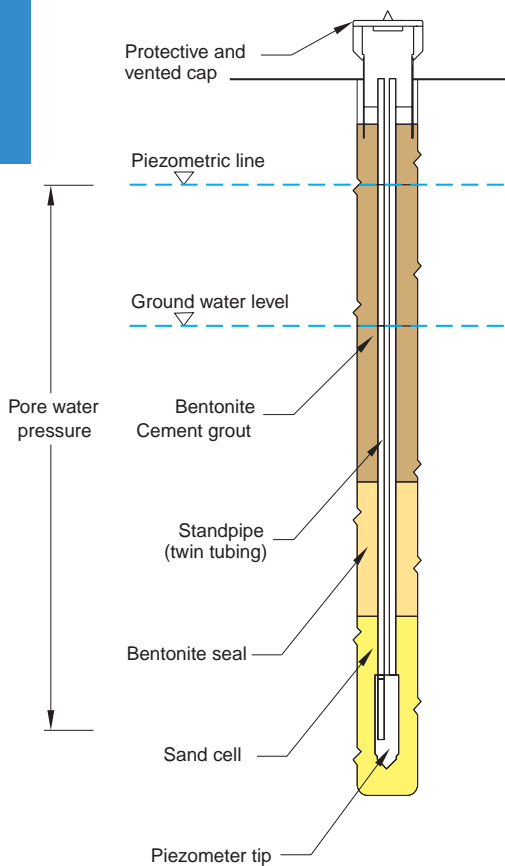
Construction and stability control of rail and road embankments, earth dams and foundations

Investigation of stability in natural and cut slopes

Hydrological and water supply investigations

Permeability tests for drainage and de-watering activities

## CASAGRANDE PIEZOMETERS (for boreholes)



Casagrande piezometers are used to detect, measure and monitor water pressure in permeable soil or rock specifically at the installed depth of the measuring tip. Typically a bentonite seal is installed immediately above and sometimes below the filter. The filter is normally connected to the surface by a pair of tube columns.

A pair of tubes is installed where water pressure measurement with a vented filter is required. Also two tubes provide a water inlet and outlet for internal flushing to clean the filter. The water level can be read by portable acoustic water level meter or automatically with a pressure transducer inserted in the standpipe or connected to the filter to form a closed circuit piezometer.

### APPLICATIONS

- Control of ground water level in soil
- Construction and stability control of rail and road embankments, earth dams and foundations
- Investigation of stability in natural and cut slopes
- Permeability testing of drainage and de-watering activities

## STANDPIPE PIEZOMETERS (for boreholes)

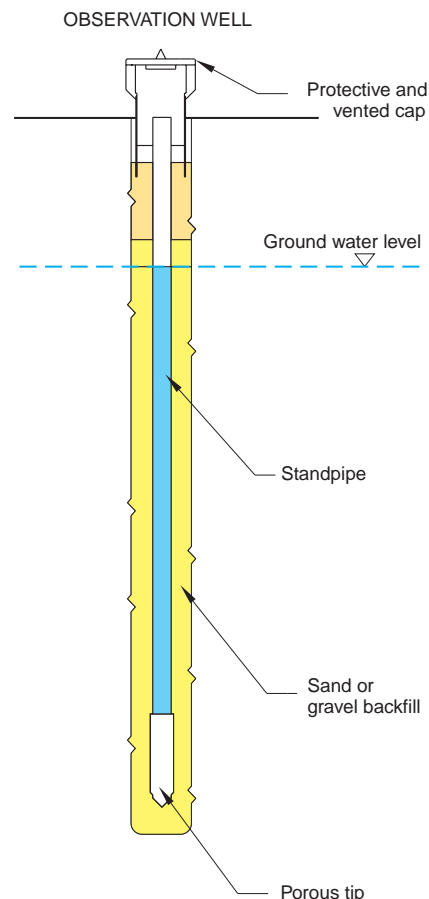
The standpipe piezometer is used to detect, measure and monitor ground water level. The filter is connected to the surface either by a single or a pair of tube columns.

A pair of tubes is installed where water pressure measurement with a vented filter is required. The filter unit and tube column(s) are installed to permit water from the full length of the borehole to enter the filter. Typically this is achieved by back filling the standpipe borehole with coarse grained sand or gravel.







The water level can be read by portable acoustic water level meter or automatically with a pressure transducer inserted in the standpipe or connected to the filter to form a closed circuit piezometer.

### APPLICATIONS

- Hydrological and water supply investigations
- Stability of embankments and foundations
- Investigations of the stability of natural and cut slopes
- Permeability tests for drainage and de-watering activities



## FILTER UNITS-APPLICATIONS AND SUITABLE MEASURING EQUIPMENT

FILTER CODE	FEATURES	SUITABLE MEASURING INSTRUMENTS
<b>P112</b> 	Filter <i>high density polyethylene tube</i> Pair of 0.5" diameter connection for two plastic tube columns Two columns facilitate filter cleaning by flushing  <b>Casagrande or standpipe boreholes</b>	C111 and C112 acoustic water level meters-manual readout
<b>P112A</b> 	Filter <i>high density polyethylene tube</i> Two connections for a 0.5" and 1.5" plastic tube column Permits simultaneous manual and automatic readout Two columns facilitate filter cleaning by flushing  <b>Casagrande or standpipe boreholes</b>	P252R vented pressure transducer using largerport-suitable for automated readout. C111 and C112 acoustic water level meters-manual readout
<b>P113</b> 	Stainless steel drive-in filter housing containing a <i>high density polyethylene filter</i> Connects to a driven-in column of steel stand pipe with a concentric plastic pipe to facilitate filter cleaning by flushing  <b>Casagrande only</b>	C111 and C112 acoustic water level meters-manual readout
<b>P101</b> 	Filter <i>high density polyethylene tube</i> 1.5" connection for single plastic tube column  <b>Casagrande or standpipe boreholes</b>	C111 and C112 acoustic water level meters-manual readout. P252C Pore pressure transducer-manual or automated readout
<b>P102</b> 	Stainless steel drive-in filter housing containing a <i>high density polyethylene filter</i> Connects to a driven column of steel stand pipe  <b>Casagrande only</b>	C111 and C112 acoustic water level meters-manual readout
<b>THF</b> 	Filter is a length of PVC tube with closed end and horizontal slots over 1 m length Available in different diameters Filter is 3 m long covered in geotechnical fabric  <b>Standpipe only</b>	P252R vented pressure transducer (suitable automation). C111 and C112 acoustic water level meters-manual readout

# CASAGRANDE AND STANDPIPE PIEZOMETERS

## ACCESSORIES AND SPARE PARTS

OP100ITPS00	Drive-in top cap	Tube top cap for steel tube- pointed for topographical survey
OP100CH0000	Protection Cap	Lockable cap to protect piezometer casing top.
OBE10050K00	Bentonite Pellets	To seal piezometer tip into borehole. Supplied in 50Kg bags

## TECHNICAL SPECIFICATIONS

Filter elements for P101, P112 and P112A are high density polyethylene tube

### TECHNICAL FEATURES

Outer Diameter	61,5 mm
Filter wall thickness	5,0 mm
Weight per unit filter length	1,5 kg/m
Maximum pore size	40 micron

### Filter element lengths

OP101002000	OP101004000	P101008000
OP112002000	OP112004000	P112008000
OP112A02000	OP112A04000	P112A08000
20 cm	40 cm	80 cm

Connecting tubes	OD mm	ID mm	Material	Length m	Appropriate filter
OTCH0005000	21	15	PVC	3.0	P112
OTCH0015000	50	40	PVC	3.0	P101, P112A and TFH
OTCH0020000	70	60	PVC	3.0	TFH
OTCH0030000	90	80	PVC	3.0	TFH
OTUF3800000	38	32	Steel	0.5, 1.0, 3.0	P102 and P113
OP1131T1700	22	17	PVC	Continuous	P113

## DRIVE-IN PIEZOMETERS

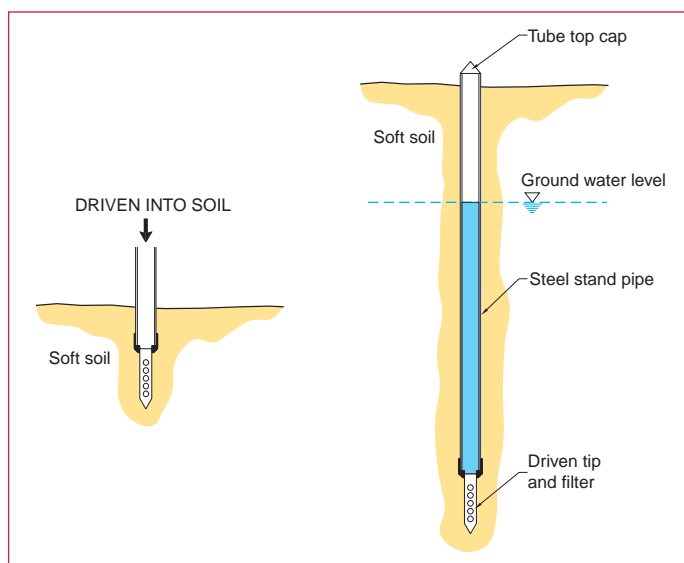
A stainless steel pointed filter unit suitable for drive-in applications. Lengths of steel are connected to the unit as the tip is driven into the ground. Suitable for installation in soft soils.

### APPLICATIONS

Casagrande piezometer for soft soils

### DRIVE-IN UNITS

OP102IF4000	Driving tip and filter
OP113IF4000	Driving tip and filter
OTUF3800000	Steel driving tube
OP1131T1700	Plastic central tube



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