PIEZOMETERS AND PRESSURE TRANSDUCERS

GEOKON®

MODEL 4500 SERIES



Front to back Model 4500C, 4500S, 4500H, 4500DP and 4500HD Vibrating Wire Piezometers (front to back).

APPLICATIONS

For the measurement of:

- Ground water elevations
- Pore water pressures
- Pump tests
- Uplift pressures in dam foundations
- Hydraulic pressures in tanks and pipelines
- Wick drain efficiency
- Water pressures behind tunnel linings



GeoNet Vibrating Wire Data Logger

OPERATING PRINCIPLE

The transducer uses a pressure sensitive diaphragm with a vibrating wire element attached to it. The diaphragm is welded to a capsule which is evacuated and hermetically sealed. Fluid pressures acting upon the outer face of the diaphragm cause deflections of the diaphragm and changes in tension and frequency of the vibrating wire. The changing frequency is sensed and transmitted to the readout device by an electrical coil acting through the walls of the capsule.

Piezometers incorporate a porous filter stone ahead of the diaphragm, which allows the fluid to pass through but prevents soil particles from impinging directly on the diaphragm.

ADVANTAGES & LIMITATIONS

The 4500 Series Vibrating Wire Piezometers and Pressure Transducers have outstanding long-term stability and reliability, and low thermal zero shift. Cable lengths of several kilometers are no problem and the frequency output signal is not affected by changing cable resistances (caused by splicing, changes of length, terminal contact resistances, etc.), nor by penetration of moisture into the electronic circuitry.

A thermistor, located in the housing, permits the measurement of temperature at the piezometer location.

All-stainless steel construction and evacuation of the capsule[1] guarantees a high level of corrosion resistance. Integral gas discharge tubes inside the main housing protect against lightning damage.

Standard porous filters are made from sintered stainless steel. High air-entry ceramic filters are also available.

Vented piezometers, designed to eliminate the effect of barometric pressure changes on water level measurements, are also available. The space inside the transducer is connected via a tube (integral within the cable) to the atmosphere. A chamber containing desiccant capsules is attached to the outer end of this tube to prevent moisture from entering the transducer cavity. A length of standard cable is spliced onto the end of the readout cable to allow for a standard connection.

Vented piezometers are better suited for water level monitoring applications, and typically not intended to be used to monitor pore pressures. Vented piezometers require more maintenance then unvented types, since moisture may find its way inside the transducer and ruin it.

For use in seawater and other chemically aggressive environments, corrosion resistant and high temperature 4500 models are also available. Refer to the 4500CR and 4500HT data sheets for more information.

Where measurements of rapidly changing pressures are required, the 4500 series piezometers and pressure transducers can be read using the CSI Dynamic VW Analyzer[2] (or similar). Alternatively, Semiconductor Piezometers and Pressure Transducers are available on request. Contact GEOKON for details.

[1] *Evacuation does not apply to vented models.*
[2] *https://www.campbellsci.com/dynamic-vibrating-wire*

TECHNICAL SPECIFICATIONS

Model	Standard Ranges	Over Range	Resolution	Accuracy[1]	Linearity	Temperature Range[2]	Thermal Zero Shift	Diaphragm Displacement	Length × Diameter	Mass
4500S	350, 700 kPa; 1, 2, 3 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	133 × 19.1 mm	0.12 kg
4500SH	350, 700 kPa; 1, 2, 3, 5, 7.5, 10, 20 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	194 × 25.4 mm	0.44 kg
4500SV	350, 700 kPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	146 × 19.1 mm	0.20 kg
4500AL/ALV	70, 170 kPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.1% F.S./°C	< 0.001 cm^3 at F.S.	133 × 25.4 mm	0.25 kg
4500B	350, 700 kPa; 1, 2, 3 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	133 × 17.5 mm	0.10 kg
4500BV	350, 700 kPa; 2 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	133 × 17.5 mm	0.10 kg
4500C	350, 700 kPa	1.5 × rated pressure	0.05% F.S.	±0.1% F.S.	< 0.5% F.S.	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	165 × 11 mm	0.09 kg
4500DP	70, 170, 350, 700 kPa; 1, 2, 3 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	187 × 33.3 mm	0.90 kg
4500HD	70, 170, 350, 700 kPa; 1, 2, 3, 5, 7.5, 10, 20 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	203 × 38.1 mm	1.50 kg
4500H[3]	70, 170, 350, 700 kPa; 1, 2, 3 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	140 × 32 mm[4] 140 × 25.4 mm	0.30 kg
4500HH[3]	5, 7.5, 10, 20, 35, 75, 100 MPa	1.5 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.05% F.S./°C	< 0.001 cm^3 at F.S.	143 × 25.4 mm	0.30 kg
4580-1 (Barometer)	200 mbar[2]	1.5 × rated pressure	0.025% F.S.[5]	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.01% F.S./°C	n/a	110 × 63.5 mm	1.18 kg
4580-2V	17 kPa	1.5 × rated pressure	0.025% F.S.[5]	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.01% F.S./°C	n/a	165 × 38 mm	0.86 kg
4580-3V	7 kPa	1.5 × rated pressure	0.025% F.S.[5]	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	–20 °C to +80 °C	< 0.01% F.S./°C	n/a	165 × 63.5 mm	1.72 kg

Note: PSI = kPa × 0.14503, or MPa × 145.03. Piezometers with a range of 350 kPa and higher are capable of reading negative pressures to –100 kPa. Contact GEOKON for more information.
[1]Accuracy established under laboratory conditions.
[2]Other ranges available on request.
[3]All high pressure sensors are potentially dangerous and care must be taken not to over-range them beyond their calibrated range. Sensors are tested to 150% of the range to provide a factor of safety.
[4]For 70 and 170 kPa range only.
[5]Depends on readout system.

MODEL 4500S/SV/SH STANDARD PIEZOMETERS

The Model 4500S/SV Standard Piezometer is designed to measure fluid pressures such as ground water elevations and pore pressures when buried directly in embankments, fills, etc. It is also suitable for installation inside boreholes, observation wells and standard (>19 mm diameter) piezometer riser pipe.

The vented version (Model 4500SV) provides automatic compensation for barometric pressure changes, via a cable with an integral vent tube.

The Model 4500SH is designed with a heavy duty housing for pressures up to 20 MPa.



MODEL 4500AL/ALV STANDARD PIEZOMETERS

The Model 4500AL is designed for low-pressure ranges. The vented version (Model 4500ALV) provides automatic compensation for barometric pressure changes, via a cable with an integral vent tube.



MODEL 4500B/BV/C SMALL DIAMETER PIEZOMETERS

These piezometers are designed to enable the automation of small diameter piezometer standpipes. The 4500B and 4500BV are designed to fit inside 19 mm pipe and the 4500C fits inside a 12 mm pipe.



4500B

4500BV

4500C

MODEL 4500DP DRIVE POINT PIEZOMETERS

The standard Model 4500DP Drive Point Piezometer has the transducer located inside a housing with an EW drill rod thread and removable pointed nose cone. The unit can be pushed directly into soft ground with the signal cable located inside the drill rod. This model is ideally suited for use in soft clays and landfills. The piezometer may be recovered at the end of the job. The Model 4500DP is available with a variety of thread configurations allowing for installation using cone penetrometer or other drill rods with adapters.



4500DP

4500DPCT

MODEL 4500HD HEAVY DUTY PIEZOMETER

The Model 4500HD Heavy Duty Piezometer is designed for direct burial in fills and dam embankments. It is used in conjunction with heavily armored cable to withstand earth movements during construction. Recommended for use in earth dams. (See also Model 4500SH)



4500HD

MODEL 4500H/HH PRESSURE TRANSDUCERS

The Model 4500H and 4500HH Pressure Transducers are supplied with ¼-18 female NPT (4500H) and 7/16-20 60 degree female medium pressure (4500HH) fittings to permit the transducer to be coupled directly into hydraulic or pneumatic pressure lines. Other pipe thread sizes are also available.



4500H

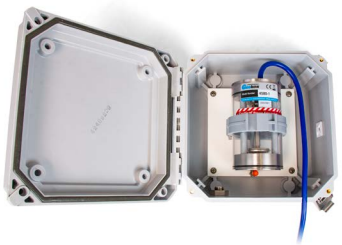
4500HH

MODEL 4580-1 BAROMETER

The Model 4580-1 is a barometer used to measure atmospheric pressure changes. The barometric sensors are calibrated at the factory and referenced to an absolute barometric reading in millibars. Model 4580-1-ENCL is a protective fiberglass enclosure with integral vent.



4580-1



4580-1-ENCL

MODEL 4580-2V/3V PRESSURE TRANSDUCERS

The Model 4580 Pressure Transducers are designed for very low fluid pressure measurements, such as groundwater elevations in wells, water levels in streams, weirs, flumes, etc. Changes in water levels of as little as 0.2 mm can be measured. Available on request.



4580-2V



4580-3V

CUSTOM PIEZOMETERS

Piezometers can be customized to meet your needs. Our staff will work with you throughout the process Common customizations include pressure range, filters, adapters, specialty cables, etc.



CUSTOM PIEZOMETER

ORDERING INFORMATION

CABLES

02-250V6-E/M: Blue PVC Cable, 6 mm (0.250") Ø, 2 twisted pairs.
03-250V0-E/M: Black Vinyl Cable, 6 mm (0.250") Ø, 3 twisted pairs.
02-250PILT-E/M: Violet Polyurethane Cable, 6 mm (0.25") Ø, 2 twisted pairs, low temperature (-40 to +80 °C), 50 ohm
02-313PI-E/M: Black Polyurethane Cable, with integral straining wire, 2 twisted pairs.
02-313V6-E/M: Blue PVC Cable, 8 mm (0.313") Ø, 2 twisted pairs with Kevlar reinforcement.
02-335VT8-E/M: Yellow Polyurethane Cable, with integral 3 mm (0.125") Ø polyethylene vent tube, 9 mm (0.335") Ø, 2 twisted pairs.
02-500PE1A-E/M: Black Polyethylene Cable, with served armor, 13 mm (0.500") Ø, 2 twisted pairs, overall braided shield.

FILTER STONES

4500-1A: Replacement stainless steel filter stone assembly for Model 4500AL Piezometer.
4500-1B: Replacement stainless steel filter stone assembly for Model 4500B Piezometer.
4500-1C: Replacement stainless steel filter stone assembly for Model 4500HD Piezometer.
4500-1S: Replacement stainless steel filter stone assembly for Model 4500S Piezometer.
4500-1SH: Replacement stainless steel filter stone assembly for Model 4500SH Piezometer.
4500-1-1: Replacement high air entry filter stone assembly for 4500S piezometers, 1 bar.
4500-1-2: Replacement high air entry filter stone assembly for 4500S piezometers, 2 bar.
4500-1-5: Replacement high air entry filter stone assembly for 4500S piezometers, 5 bar.
4500-2-1: Replacement high air entry filter stone assembly for 4500AL piezometers, 1 bar.
4500-2-2: Replacement high air entry filter stone assembly for 4500AL piezometers, 2 bar.
4500-2-5: Replacement high air entry filter stone assembly for 4500AL piezometers, 5 bar.
4500-2-6: Replacement high air entry filter stone assembly for 4500HD piezometers, 1 bar.
4500-2-7: Replacement high air entry filter stone assembly for 4500HD piezometers, 2 bar.
4500-2-8: Replacement high air entry filter stone assembly for 4500HD piezometers, 5 bar.
4500-3: Replacement stainless steel mesh type filter, mesh only, for 4500S/4500B piezometers.
4500-5: Factory sealed piezometer cap for shipping saturated piezometers with HAE filters, S size.
4500-5A: Factory sealed piezometer cap for shipping saturated piezometers with HAE filters, AL size.
4500-5B: Factory sealed piezometer cap for shipping saturated piezometers with HAE filters, HD size.

SPLICE KITS

4500-9-HD: Splice kit for armored cable, factory splice only.
4500-9-HDF1: Splice kit for armored cable, field use.
4500-9-HDF2: Splice kit for armored to unarmored cable, field use.
4500-9EP: Epoxy Resin and Hardener (138cc).
4500-9-SSI: Splice kit for settlement systems, for vented electrical cable and fluid filled tubes.
4500-17-1: Splice Kit for 5-8 mm (0.187-0.313") cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, and epoxy kit.
4500-17-1-SR: Splice Kit for 5-8 mm (0.187-0.313") strain relief cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, strain relief clamps, and epoxy kit.
4500-17-2: Splice Kit for 9-10 mm (0.335-0.375") cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, and epoxy kit.
4500-17-2-THERM: Splice Kit for 9-10 mm (0.335-0.375") thermistor string cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, and epoxy kit.
4500-17-2-VENT: Splice Kit for 9-10 mm (0.335-0.375") vented cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, barbed tube union, and epoxy kit.
4500-17-3: Splice Kit for 13-16 mm (0.500-0.625") cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, and epoxy kit.
4500-17-3-THERM: Splice Kit for 13-16 mm (0.500-0.625") thermistor string cable, complete with PVC tube, end caps with chord grips installed, Posi-Lock connectors, and epoxy kit.

CONNECTORS

4500-20: 10-Pin Male Connector with Cap.
4500-20V: 10-Pin Male Pigtail with tinned leads.
4500-21: 10-Pin Female Connector with Cap
4500-21V: 10-Pin Female Pigtail with tinned leads.

ACCESSORIES

4500-6: Canvas bag.
4500-7: Moisture trap with desiccant capsules (2) for 3 mm (⅛") polyethylene tube vent line.
4500-8: Desiccant capsule for moisture traps.
4500-18-1: Freeze plug for S/SH style piezometers.
4500-18-2: Freeze plug for AL style piezometers.
4500-18-3: Freeze plug for HD style piezometers.
4500-18-4: Freeze plug for B style piezometers.
4500-40-1: Magnetic Shield for 19 mm (3/4") Ø sensor.
4500-40-2: Magnetic Shield for 25 mm (1") Ø sensor.
4500-40-3: Magnetic Shield for 38 mm (1.5") Ø sensor.
4580-1-ENCL: Standard enclosure for Barometer. Includes mounting plate, clamp, and breather vent.
CON-A350: Kellems Grip for 6–8 mm (0.22–0.32") Ø Cable.
CON-A351: Kellems Grip for 7–9 mm (0.29–0.37") Ø Cable.

COMPATIBLE READOUTS AND DATA LOGGERS

GK-404: Handheld Readout
GK-406: Vibrating Wire Analyzer
8800 and 8900 Series: GeoNet Wireless Mesh Data Acquisition System
8910 Series: GeoNet Wireless LoRa® Data Acquisition System
8920 and 8921 Series: GeoNet Cellular Data Loggers
8930 Series: GeoNet Wi-Fi Data Loggers
8951 Series: GeoNet Satellite Data Loggers
8940 Series: GeoNet Local Data Loggers
8600 Series: Data Loggers

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