

# 4500 Series Pressure Transducers & Piezometers

## MONITORING APPLICATIONS

- Ground water level and elevation
- Pore water pressure and wick drain efficiency
- Foundational uplift pressure monitoring

## FEATURES & ADVANTAGES

- Rugged, long-term stability
- Low thermal zero shift
- Corrosion and EMP resistant
- Frequency signal output



## OPERATING PRINCIPLE

4500 Series Transducers use 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 which alter the tension and frequency of the vibrating wire. This frequency change is sensed and transmitted to the read-out device by an electrical coil acting through the walls of the capsule.

Piezometers incorporate a porous filter stone ahead of the diaphragm, which allows fluid to pass through while preventing soil particles from contacting the diaphragm directly.

## ADVANTAGES AND LIMITATIONS

4500 Series Vibrating Wire Piezometers and Pressure Transducers have outstanding long-term stability and reliability and low thermal zero shift. All 4500 Series Transducers utilize a frequency output signal, so cable lengths of several kilometers are no problem; signal output is not affected by changing cable resistances caused by splicing, cable lengths, or terminal contact resistances, and are immune to the effects of moisture contact with the electronic circuitry. A thermistor located within the housing permits the measurement of temperature at the piezometer's location.



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

All-stainless steel (or titanium, by request) construction and evacuation of the capsule guarantees a high level of corrosion resistance for all 4500 Series Transducers. Integral gas discharge tubes inside the main housing protect against lightning damage.

Standard porous filters are made from 316 stainless steel. High air-entry ceramic filters are available for use in applications requiring that air be prevented from passing through the filter.

Vented versions of all models are available to provide automatic compensation for barometric pressure fluctuations. Negative pressures up to 1 Bar can be measured.

Vibrating wire pressure transducers are not suitable for the measurement of rapidly changing pressures; for such projects ask about the Model 3400.

#### MODEL 4500S(H), 4500AL(V) STANDARD PIEZOMETERS



Model 4500S (front) and Model 4500AL (rear) Standard Piezometers.

The standard Model 4500S piezometer is designed to measure fluid pressures caused by ground water elevation and pore pressure when buried directly in embankments and fills. It is also suitable for installation inside boreholes, observation wells, and standard piezometer riser pipe.

For pressures exceeding 3 Mpa order the Model 4500SH.

The Model 4500AL is designed for low-pressure ranges. The vented version, Model 4500ALV, automatically compensates for barometric pressure changes. Internal thermistors are also included to measure temperature.

#### MODEL 4500DP DRIVE POINT PIEZOMETERS



Model 4500DP Drive Point Piezometers.

The Model 4500DP Drive Point Piezometer has the transducer located inside a housing with an EW drill rod thread and removable pointed nose cone. When threaded onto the end of an EW drill rod, these units can be pushed directly into soft ground with the necessary signal cable contained within the rod shaft. This model is ideally suited for use in soft clays and landfills. The piezometer's design also allows it to be recovered at the end of each job or project. Models with standard metric threads, for installations using cone penetrometers and other adaptable drill rods, are available by request.

#### MODEL 4500B, 4500C SMALL DIAMETER PIEZOMETERS



Model 4500C (front) and Model 4500B (rear) Small Diameter Piezometers.

These piezometers are designed to enable the automation of small diameter piezometer standpipes. The 4500B fits inside 19 mm pipe, while the thinner 4500C fits inside 12 mm pipe.

#### MODEL 4500HD HEAVY DUTY PIEZOMETER



Model 4500HD Heavy Duty Piezometer.

The Model 4500HD Heavy Duty Piezometer is designed for direct burial in fills and dam embankments. The Model 4500 is typically used in conjunction with heavily armored cable to withstand earth movements during construction. These piezometers are well suited for use in earth dams.

### MODEL 4500H(H) PRESSURE TRANSDUCERS



Model 4500H Pressure Transducer.

The Model 4500H and 4500H(H) Pressure Transducers are supplied with a ¼-18 NPT pipe thread fitting to permit the transducer to be coupled directly into hydraulic or pneumatic pressure lines. Other pipe thread sizes are also available by request.

### MODEL 4500HT HIGH TEMPERATURE PIEZOMETER



Model 4500HT High Temperature Piezometer.

The Model 4500HT High Temperature Piezometer is designed for applications with temperatures reaching 230°C. Two versions are available, for continuous use up to either 200°C or 230°C respectively. These sensors are supplied with either mineral insulated cables or Teflon cables sheathed in stainless steel tubing.

### MODEL 4500TI TITANIUM PIEZOMETER



Model 4500TI Titanium Piezometer.

The Model 4500TI is designed specifically for use in highly corrosive environments such as landfills and leach fields. This model should also be used in critical areas where long term survivability is essential, including nuclear waste repositories and aggressive mine tailings. All exterior surfaces are made from titanium.

### MODEL 4580 PRESSURE TRANSDUCER



Model 4580 Pressure Transducer.

Model 4580 Pressure Transducers are designed to for very low fluid pressure measurements. Monitoring applications include groundwater elevation in wells, and water levels in streams, weirs, flumes, and more. Changes in water levels of as little as 0.2 mm can be measured. Non-vented versions of the Model 4580 can also be used as a barometers to measure atmospheric pressure changes.

### MODEL 4500AR AUTORESONANT PIEZOMETER



Model 4500AR "Autoresonant" Piezometer.

The Model 4500AR "Autoresonant" Piezometer is designed for use with existing data acquisition systems incapable of reading standard (pluck and read) vibrating wire sensors. It can also be used where low frequency (< 20 Hz) dynamic measurements are required.

The Model 4500AR is powered using a 6-24 VDC supply, which yields a 5 V square wave output as the sensor frequency. This high-output offers excellent noise immunity and enhanced signal transmission over long (300 m or more) cables. The Model 4500AR is available in standard pressure ranges with corresponding resolution, linearity, and accuracy.

MODEL	STANDARD RANGES	OVER RANGE	RESOLUTION	ACCURACY	LINEARITY	TEMPERATURE RANGE <sup>1</sup>	THERMAL ZERO SHIFT	DIAPHRAGM DISPLACEMENT	LENGTH X DIAMETER	MASS
<b>4500S</b>	350, 700 kPa; 1, 2, 3 MPa	2 × 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 <sup>3</sup> at F.S.	133 × 19.1 mm	0.12 kg
<b>4500SH</b>	5, 7.5, 10, 20 MPa	2 × 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 <sup>3</sup> at F.S.	194 × 25.4 mm	0.44 kg
<b>4500AL/ALV</b>	70, 170 kPa	2 × 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 <sup>3</sup> at F.S.	133 × 25.4 mm	0.25 kg
<b>4500B</b>	350, 700 kPa; 1, 2, 3 MPa	2 × 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 <sup>3</sup> at F.S.	133 × 17.5 mm	0.10 kg
<b>4500C</b>	350, 700 kPa	2 × 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 <sup>3</sup> at F.S.	165 × 11 mm	0.09 kg
<b>4500DP</b>	70, 170, 350, 700 kPa; 1, 2, 3, 5, 7.5 MPa	2 × 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 <sup>3</sup> at F.S.	187 × 33.3 mm	0.90 kg
<b>4500HD</b>	70, 170, 350, 700 kPa; 1, 2, 3, 5, 7.5 MPa	2 × 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 <sup>3</sup> at F.S.	203 × 38.1 mm	1.50 kg
<b>4500H</b>	70, 170, 350, 700 kPa; 1, 2, 3 MPa	2 × 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 <sup>3</sup> at F.S.	140 × 32 mm <sup>2</sup> 140 × 25.4 mm	0.30 kg
<b>4500HH</b>	5, 7.5, 10, 20, 35, 75, 100 MPa	2 × 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 <sup>3</sup> at F.S.	143 × 25.4 mm	0.30 kg
<b>4500HT</b>	700 kPa; 1, 2, 3, 5, 7.5, 10, 25, 50, 75, 100, 150 MPa	2 × rated pressure	0.025% F.S.	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	0°C to +230°C	< 0.05% F.S./°C	< 0.001 cm <sup>3</sup> at F.S.	133 × 19.1 mm	0.12 kg
<b>4500Ti</b>	350, 700 kPa; 1, 2, 3, 5, 7.5 MPa <sup>1</sup>	2 × 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 <sup>3</sup> at F.S.	125 × 25.4 mm	0.19 kg
<b>4580-1 (Barometer)</b>	200 Mbar <sup>1</sup>	2 × rated pressure	0.025% F.S. <sup>3</sup>	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	-20°C to +80°C	< 0.05% F.S./°C	n/a	110 × 63.5 mm	1.18 kg
<b>4580-2/2V</b>	17, 35 kPa	2 × rated pressure	0.025% F.S. <sup>3</sup>	±0.1% F.S.	< 0.5% F.S. (±0.1% F.S. optional)	-20°C to +80°C	< 0.05% F.S./°C	n/a	165 × 38 mm	0.86 kg
<b>4580-3V</b>	7 kPa	2 × rated pressure	0.025% F.S. <sup>3</sup>	±0.1% F.S.	< 0.5% F.S.	-20°C to +80°C	< 0.05% F.S./°C	n/a	165 × 63.5 mm	1.72 kg
<b>4500AR<sup>4</sup></b>	7, 17, 35, 70, 170, 350, 700 kPa; 1, 2, 3, 5, 7.5, 10, 20, 25, 35, 50, 75, 100, 150 MPa	2 × rated pressure	0.025% F.S. <sup>3</sup>	±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 <sup>3</sup> at F.S.	varies according to pressure range	varies according to pressure range

Note: PSI = kPa × 0.14503, or MPa × 145.03

<sup>1</sup>Other ranges available on request.

<sup>2</sup>For 70 and 170 kPa range only.

<sup>3</sup>Depends on readout system.

<sup>4</sup>Power Supply Voltage Range: 6 V (min), 12 V (nom), 24 V (max). Power Supply Current: 15.5 mA @ 12 V @ 20°C. Operating Temperature Range: 0° to +70°C.

VW Output Signal Voltage: 5 V square wave @ fundamental vibrating wire frequency. VW Output Signal Impedance: 50 ohms. Cable: 3 twisted pairs.

## APPLIED GEOMECHANICS

140 Chestnut St.

San Francisco CA, 94111

T: 1+415-364-3200

F: 1+415-861-1448

Geomechanics.com

A CARBO Company

