Applications
Autoresonant Vibrating Wire Sensors are ideally suited where long term reliability and the need for dynamic measurements are required. Applications include...

- Bridge Testing
- Wind Turbines
- Responses to Earthquakes
- Response to wind or traffic loading
- Response to wave action

Operating Principle
Autoresonant Vibrating Wire Sensors expand the possibilities of dynamic monitoring while retaining the inherent long-term stability of GEOKON® vibrating wire instruments.

Autoresonant sensors are particularly useful where low frequency dynamic measurements are required on structures in adverse environments over extended periods of time. Typical applications include the monitoring of wind turbines, bridges, traffic effects and structures that may be subject to earthquake or wind loading.

GEOKON offers three types of autoresonant sensor. One type uses a custom sensor and an electronic adaptor (Model 4500CPR), another uses the standard vibrating wire sensor and an electronic adaptor (Model 8020-42CPR) and the third type is a custom sensor with internal electronics (AR Series).

4500CPR
The Model 4500CPR comprises a custom vibrating wire sensor, in which two independent coils are used in a phase-locked loop to keep the gauge oscillating at its resonant frequency, and a signal conditioner which excites the gauge and provides a 4-20 mA or frequency output with a 100 Hz dynamic range.

8020-42CPR
Single Coil Autoresonant Adapter
Historically, autoresonant vibrating wire gauges have employed two coils (as in the 4500CPR). One, the Transmit (excitation) coil, provides a phase synchronous pulse (pluck) to maintain oscillation, and the second, the Receive (reading) coil, recovers the vibrating wire signal. The two coil approach, while dependable, adds to the cost and imposes a mechanical limitation to the design and construction of the gauge.

The 8020-42CPR Single Coil Autoresonant adapter is a device that allows the standard (single coil, or two coils in series) vibrating wire gauges to be driven in an autoresonant mode, instead of its usual “Pluck and Read” mode.

The 8020-42CPR adaptor excites the VW sensor using a “pluck sustained” circuitry where the gauge wire is kept vibrating by “injecting” a short pulse synchronous to the gauge frequency. This system provides a 4-20 mA and a frequency output with a dynamic range of 20 Hz, which can be multiplexed thereby allowing for use with several sensors.
AR Series
The AR Series is designed to be used with readout systems that can read frequency but do not have the capability to “pluck” the VW gauge. This sensor has built-in electronics that, upon power-up, cause the gauge wire to vibrate in a continuous mode at its resonant frequency until the power is removed. Continuous operation has no effect on the gauge life. The output from the sensor is a 5 volt DC square wave at the sensor frequency. A DC voltage input (6-24 volts) is required to excite the gauge. The current consumption is approximately 21 mA at 12 VDC. The gauge output is independent of the input voltage.

As with most GEOKON vibrating wire sensors, the AR sensor includes a thermistor for measuring temperature. The signals from the VW transducer are high level frequency and will interfere with the thermistor output if left powered during the period that the thermistor is being read. If the temperature reading is important the power to the VW transducer should be switched off while the temperature is taken.

The AR option was originally designed for incorporation with the 4500 Series VW piezometers, but is available for most GEOKON sensors with frequency ranges between 1200-4500 Hz (please contact GEOKON).

Technical Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Input</th>
<th>Output</th>
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<tbody>
<tr>
<td>4500CPR</td>
<td>±12 VDC at 50 mA (max)</td>
<td>4-20 mA; Frequency¹ (100 Hz dynamic range)</td>
</tr>
<tr>
<td>8020-42CPR</td>
<td>+12 VDC at 50 mA (max)</td>
<td>4-20 mA; Frequency (20 Hz dynamic range)</td>
</tr>
<tr>
<td>4500AR</td>
<td>+12 VDC at 25 mA (max)</td>
<td>Continuous Frequency at 5 volt level (20 Hz dynamic range)</td>
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</tbody>
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¹Open collector output—requires external pull-up termination resistor.

Requirements, Limitations and Advantages

<table>
<thead>
<tr>
<th>Model</th>
<th>Transducer</th>
<th>Limitations</th>
<th>Advantages</th>
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</thead>
<tbody>
<tr>
<td>4500CPR</td>
<td>Custom VW transducer with 2 independent coils¹</td>
<td>Current output span limits must be tuned to each sensor; Cannot be multiplexed; Only available for VW sensors with frequency ranges between 1200-4500 Hz</td>
<td>100 Hz dynamic range</td>
</tr>
<tr>
<td>8020-42CPR</td>
<td>Standard VW transducer¹</td>
<td>Default current output span limits set from 4 mA (1500 Hz or 2250 digits) to 29 mA (3500 Hz or 12250 digits), full range of each transducer occupies a portion of this span¹; 20 Hz dynamic range; Only available for VW sensors with frequency ranges between 1200-4500 Hz</td>
<td>Capable of being multiplexed</td>
</tr>
<tr>
<td>4500AR</td>
<td>Custom VW transducer with integral electronics¹</td>
<td>Only available for VW sensors with frequency ranges between 1200-4500 Hz</td>
<td>High level output, good noise immunity, can be read by dataloggers that read frequency but cannot excite VW sensors; Capable of being multiplexed²</td>
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¹Standard, single vibrating wire transducers only; supplied separately.
²Not compatible with the 8 gauge Model 4950-3 or 4950HT-3 Biaxial Stressmeters.
³Specially wired Model 4800 Load Cells are required to ensure compatibility; please contact GEOKON for details.
⁴Limits may be factory adjusted, as required, anywhere within the 1200-4500 Hz span.
⁵Either switch (multiplex) power and signal, or power continuously and multiplex the signal.