

Vibrating Wire Load Cells

Applications

The Model 4900 Load Cells are used for...

- Monitoring loads in tie-backs and rock bolts in the walls of excavations
- Monitoring long-term loads in concrete dam tie-downs
- Monitoring loads in steel arch tunnel supports
- Monitoring loads in cross lot struts



● Closeup of cable insertion showing Kellems® wire mesh grip.



● Model GK-405 Vibrating Wire Readout for use with the Model 4900 Load Cells.



● Model 4900 Vibrating Wire Load Cells (annular and solid).

Operating Principle

The Model 4900 Load Cell is designed primarily for use on tiebacks and rockbolts and particularly where long term monitoring is required. They may also be used during pile load tests and for monitoring loads in struts, tunnel supports, etc. In practically all cases, the load cells are used in conjunction with bearing plates positioned on either side of the load cell.

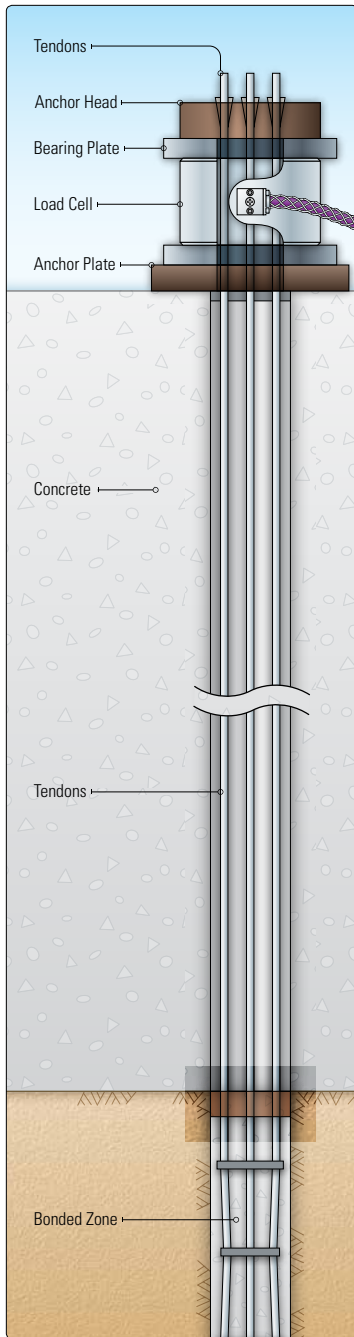
Vibrating Wire load cells provide excellent long-term stability and can be used with long cables without adversely affecting the output. They are water resistant, have a low temperature coefficient and have been used successfully in high radiation environments. Versions that are fully waterproof, for submersion under water, are also available (please contact **GEOKON®** for details).

When used to measure tensile loads in tiebacks or rockbolts, the load cell is trapped between bearing plates positioned between the jack and the structure, either below the anchor head for permanent installations or above the anchor head for proof-testing.

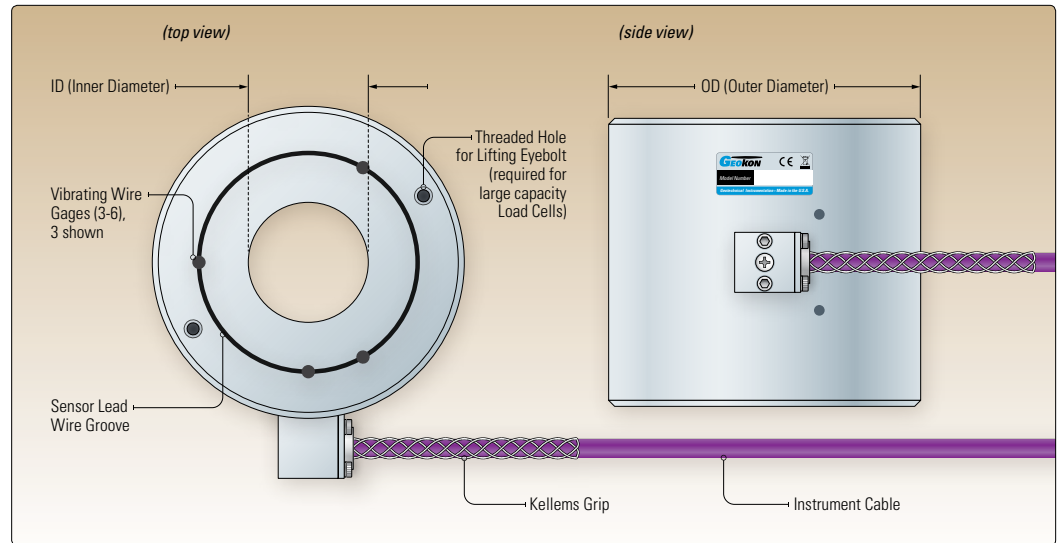
Advantages and Limitations

The Model 4900 Load Cell body is constructed in the form of a high strength steel cylinder in which between 3 to 6 vibrating wire strain gages are embedded to measure the change of strain in the cylinder as it comes under load. Readings from the individual gages are averaged and used in conjunction with the calibration factor to calculate the applied loads. Multiple gages are used to account for the effects of eccentric loading.

The Model 4900 Vibrating Wire Load Cell is not suitable to measure dynamic loads and, although they are easily datalogged, the multiplicity of sensors requires a corresponding number of channels on the multiplexer. Consequently, for dynamic and or datalogged applications it may be preferable to use the Model 3000 Load Cell (see the Model 3000 Series data sheet).



● Model 4900 used in concrete dam tie-down.



● Model 4900 Series Load Cell components.

System Components

Signals from the load cell are transmitted to the readout location by means of a multi-conductor shielded cable, which may be armored for extra protection. **Kellems®** grips prevent the cable from being pulled from the load cell. Larger size load cells are supplied with lifting lugs.

Readout of the Model 4900 Load Cells is by Model GK-404, GK-405 or Model 8021 Micro-1000 Datalogger. Manual readout can be facilitated using a multi-channel switch box connected to the end of the cable. In the case of the GK-405 Readout, a built-in multiplexer automatically scans through all the vibrating wire sensors, averages the readings, applies the calibration constant and displays the load in engineering units.

To minimize eccentric and uneven loading, the use of the thick machined-flat bearing plates and centralizer bushings (where necessary) are recommended.

Bearing plates should be machined flat and large enough to totally cover the load bearing surface of the load cell. The thickness is related to the load cell/hydraulic jack size mismatch: the greater the size disparity the thicker the bearing plate. Typical thickness ranges from 25 to 75 mm.

If the size of the tie-back or rock bolt is more than 20 mm smaller than the internal diameter of the load cell, then centralizer bushings are recommended.

Technical Specifications

Rated Capacities ¹	100 to 10,000 kN
Over Range ²	150% F.S.
Resolution	0.025% F.S.
Accuracy ³	±0.5% F.S.
Output	1200-2800 Hz
Temperature Range ⁴	-20°C to +80°C
Cables	Multi-conductor shielded pairs with PVC outer jacket
Internal Diameters ¹	solid, 25, 50, 75, 100, 125, 150, 200, 250 mm

¹Other capacities and diameters available on request.

Calibrations that exceed **GEOKON®**'s NIST traceable capacity of approximately 10,675 kN are subcontracted to an accredited testing laboratory.

²With no calibration shift.

³Established under laboratory conditions. System accuracy depends on end loading conditions.

⁴Other ranges available on request.