

DAM MONITORING DURING CONSTRUCTION

INTELLIGENT GEO DATA LOGGER READS VIBRATING WIRE SENSORS



A hydroelectric dam under construction in Serbia required monitoring of structural properties at multiple locations to guarantee long-term strength and stability. Therefore the dam's construction engineers put forth a proposal for a large number of geotechnical sensors to be installed and used during construction. These sensors included vibrating wire piezometers, joint meters, extensometers, and strain gages. As part of the proposal, the sensors needed to be connected to a data logger to provide an automated long-term monitoring solution. Additionally, the engineers specified that each data logger needed

to have a large number of inputs suitable for vibrating wire sensors, compatibility with a [SCADA system](#) for centralized monitoring, and the ability for future expansion.

INSTALLATION

Monitoring Equipment:

[dataTaker DT85G Geo Logger](#) x2

[dataTaker Channel Expansion Module \(CEM20\)](#) x6

Sensors:

1. Vibrating wire sensors:
 - Piezometers
 - Jointmeters
 - Fill extensometers
 - Strain gauges
2. Temperature sensors
3. Pulse output flowmeters



Engineers chose the dataTaker DT85G because of its compatibility with vibrating wire sensors, the ability to handle a large number of inputs, and its versatile communications capabilities.

USAGE

Ideal for all geotechnical data logging applications, the DT85G model has 16 analog channels capable of measuring up to 16 vibrating wire strain gages with temperature compensation or 48 vibrating wire strain gages without thermistors. The

[dataTaker](#) can monitor a wide variety of sensors that are based on vibrating wire gauges and is used in geotechnical monitoring applications such as dam wall monitoring, mining excavation, tunnel wall monitoring, and structural monitoring. [Vibrating wire](#) sensors were used due to their ability to provide highly accurate measurements that are not affected by long lengths of cable. Connected to the dataTakers, these sensors now provide information about the dam's stress, deformation, uplift, and displacement.

A built-in “pluck” circuit in the logger provides the excitation to the vibrating wire and then a phase-locked loop (PLL) captures the resonant frequency. Parameters allow fine-tuning of the delay between the excitation and measurement along with the measurement period to obtain accurate measurements. A built-in headphone output allows the user to listen to the gauge for diagnostics. The logger incorporates extensive calculation capabilities to convert the measured frequency to strain. It also has the capability to read thermistors embedded in the gauge to measure temperature and to apply the appropriate temperature correction factor.

Since the DT85G has universal analog input it can also measure many types of other sensors including those that provide a voltage or 4-20 mA current output, resistive devices, conventional full, half, and quarter bridge strain gauges, and most types of temperature sensors such as thermocouples, RTD’s and thermistors. The DT85G also has digital and counter inputs to measure pulse output flowmeters. Input channel count can be expanded simply by connecting dataTaker Channel Expansion Modules (CEM20s) which provide 20 additional inputs per module. In this example, two DT85G data loggers are each paired with three CEM20 channel expansion modules allowing for a total of 146 vibrating wire sensors to be distributed throughout the dam structure. If needed, the dataTaker system can be further expanded to connect up to 640 vibrating wire sensors per logger. Retrieval of stored data can be achieved via a direct USB or Ethernet connection to the data logger, downloaded using a USB memory stick plugged into the data logger, or offloaded automatically via FTP. In this application, live data for selected sensors is also retrieved via Modbus TCP by a SCADA system so that it can be displayed in the main control room of the dam.

DATA TAKER DT85G FEATURES

- A cost-effective data logger expandable up to 320 4-wire channels, 640 differential or 960 single-ended analog inputs

- Provides excitation for vibrating wire and other geotechnical sensors
- Compatible with all major sensor brands –Slope indicator, RST Instruments, Geokon, Soil Instruments, Rocctest, AGI, etc.
- Built-in FTP server automatically uploads data for remote operation
- Rugged design and construction provides reliable operation in the environmental extremes of geotechnical applications
- Modbus RTU or TCP for easy integration with other equipment

BENEFITS

The customer uses the pair of [dataTaker data loggers](#) as a key part of this advanced dam monitoring system. The dataTaker DT85G is extremely versatile and easy to configure with the ability to support a wide variety of sensors, built-in math functions to calculate strain and apply temperature corrections, multiple communication protocols, and sophisticated data management and alarming capabilities. It also offers very low power operation with the ability to run off a battery in the event of a loss of mains power. The dataTaker's high channel count and built-in support for major vibrating wire sensors provide the ideal data acquisition and monitoring solution for engineers working in the geotechnical environment.

For more information on the [dataTaker DT85G Geo Data Logger](#), or to find the ideal solution for our applicatoin -specific needs, contact a CAS Data Logger Applications **(800) 956-4437** [request more information](#).