

d-GMM (SPECTRE)



YieldPoint's **d-GMM (SPECTRE)** displacement sensor integrates magnetostrictive technology to produce a high precision digital instrument comprising a non-contact displacement sensor and digital temperature sensor. An on-board microcontroller applies temperature compensation and outputs a digital signal. Both the resolution (<0.01mm) and accuracy (0.25% linearity typical) are significantly better than for similarly priced technology.

The output signal includes the instrument's unique Sensor_ID, the Sensor_Type as well as the temperature and displacement data. A balanced differential RS485 output signal is widely recognized for reliability in harsh environments. The signal can be routinely transmitted over 500m of lead-wire.

The **d-GMM (SPECTRE)** is easy to install either (i) as a GMM by attaching to a 5/8" rock-bolt, or (ii) in a wide range of other crack-meter configurations. The device is fully retrievable. The electronics are hermetically sealed and the sensor can be submerged indefinitely.

Each instrument is individually calibrated to ensure that the resolution (<0.01mm) and accuracy (0.5% linearity typical) are an order of magnitude better than for similarly priced technology. The inherently digital form of the signals eliminates the necessity for expensive analog-to-digital conversion and results in low cost monitoring peripherals that output data in real world units (mm and degC).

Features:

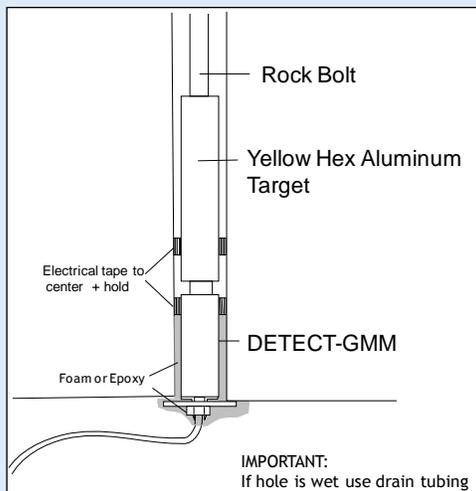
- ▲ *On-board digital signal processing*
- ▲ *Digital (d-tech) 125mm (5 inch) stroke length*
- ▲ *High accuracy (0.5% FS) and resolution (0.01% FS)*
- ▲ *Individual calibration with coefficients stored in memory*
- ▲ *RS485 Output signal (9600,8,N,1) ASCII encoded*
- ▲ *Microcontroller provides output in real world units (mm and °C)*
- ▲ *Unique ID facilitates plug 'n play networking*
- ▲ *Digital temperature sensor for accurate compensation*
- ▲ *Magnetostrictive technology provides immunity to hostile environment*
- ▲ *Easy to interface with dataloggers (d-LOGGER), Ethernet and WiFi (DESTINY)*
- ▲ *Competitively priced*

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Technology

Installation

The **d-GMM** is typically installed using a mechanical rock-bolt in a borehole as shown in the figure below. However different customers have found various ingenious ways to monitor deformation



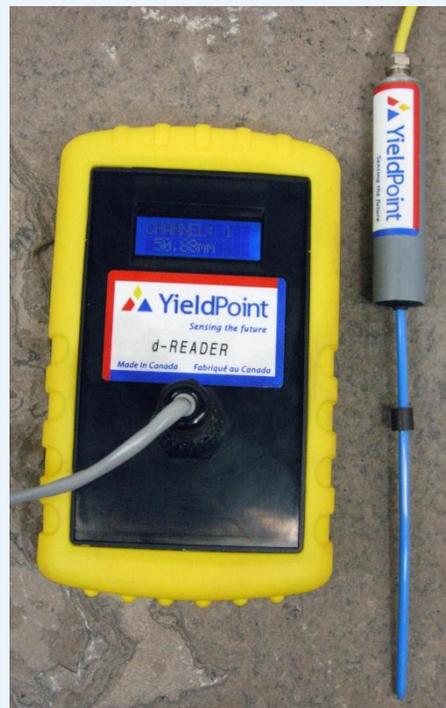
If installed in borehole the **d-GMM** target can be tightened with socket wrench (purchased separately). The GMM itself is usually secured using rock-bolt resin or expandable foam. In wet holes it is important to use a drain tube.

Shear Displacement

When deployed as a crack-meter, **SPECTRE** can measure a combination of shear and dilation. This creates opportunities for monitoring large displacements on cracks subjected to mixed mode deformations.

Telemetry

Manual Readout



Readout can be made using YieldPoint's low cost manual readout box, which performs diagnostics on the lead-wires, recognizes the sensor type and ID and outputs the displacement and temperature data directly in mm and °C.

Automated Data Retrieval

Clusters of sensors (4 per Slave) can be polled YieldPoint's **DESTINY** (Digitally Enabled Sensor Transducer and Instrumentation Network from YieldPoint) technology. **DESTINY/IP** is a low cost interface to Ethernet or WiFi running TCP/IP. Other versions of **DESTINY** can interface with the pre-existing leaky feeder wireless or even an ESG seismic system.

This solution can save time and money by transmitting data directly to a central control room or an engineer's desktop computer.

Applications

The range of applications for the d-GMM are virtually limitless. Some of the more common scenarios include:

- ▲ Crack monitoring.
- ▲ Monitoring tunnels and drifts.
- ▲ Monitoring intersections wide spans
- ▲ Monitoring brows
- ▲ Monitoring fill mats
- ▲ Monitoring bulkheads

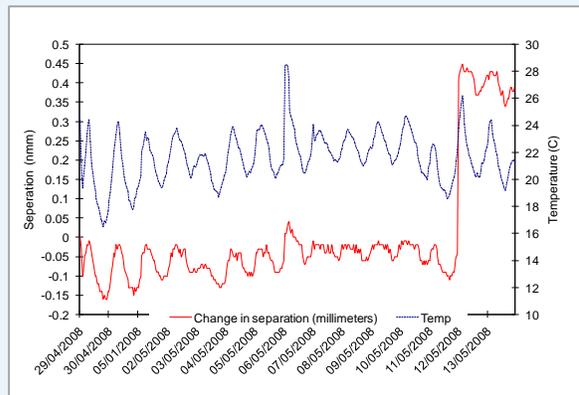
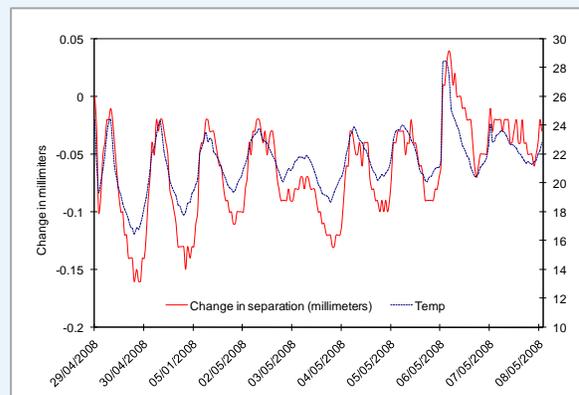
Specifications

- ▲ **Borehole size:** 30mm+
- ▲ **Range (F.S.):** 250mm, 125mm, 100mm or 50mm. Temp: -40 to 125°C
- ▲ **Core Technology** 126mm magnetostrictive + temperature sensor
- ▲ **Output Signal:** RS485(9600,8,N,1) ASCII encoded string with Sensor_ID, Temp, and Displacement values.
- ▲ **Displ. Resolution:** 0.01mm with hand held readout
- ▲ **Displ, Hysteresis:** 0.025mm
- ▲ **Displ Repeatability:** 0.025mm
- ▲ **Displ.Linearity:** typically 0.01mm
- ▲ **Temp. Range:** -40 - 125°C
- ▲ **Temp Accuracy:** +/- 2°C
- ▲ **Temp Resolution:** 0.1°C

Case Studies



A SPECTRE GMM monitoring a crack in a dam buttress.



Monitoring cracks on an exterior basement wall. RHS scale is temperature