

## 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:

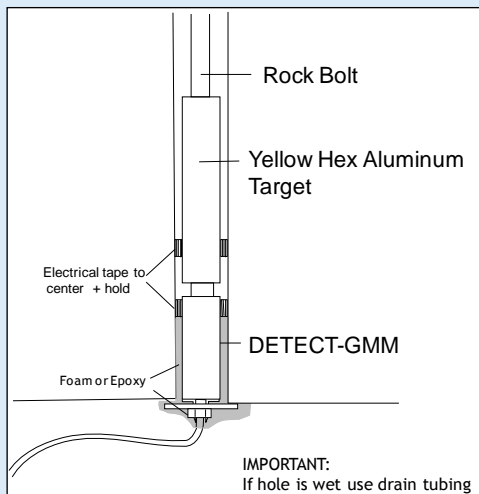
- ▲ *On-board digital signal processing*
- ▲ *Digital (d-tech) 125mm (5 inch) stroke length*
- ▲ *High accuracy (0.5% FS) and resolution (0.01% FS)*
- ▲ *Individual calibration with coefficients stored in memory*
- ▲ *RS485 Output signal (9600,8,N,1) ASCII encoded*
- ▲ *Microcontroller provides output 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*

# d-GMM(SPECTRE)

## 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



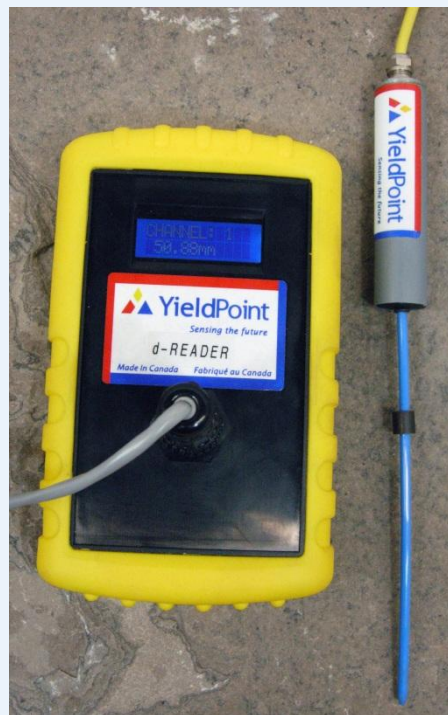
If installed in borehole the **d-GMM** target can be tightened with socket wrench (purchased separately). The GMM itself is usually secured using rock-bolt resin or expandable foam. In wet holes it is important to use a drain tube.

### 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

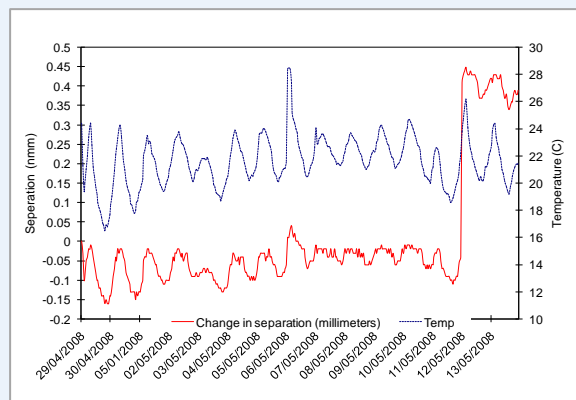
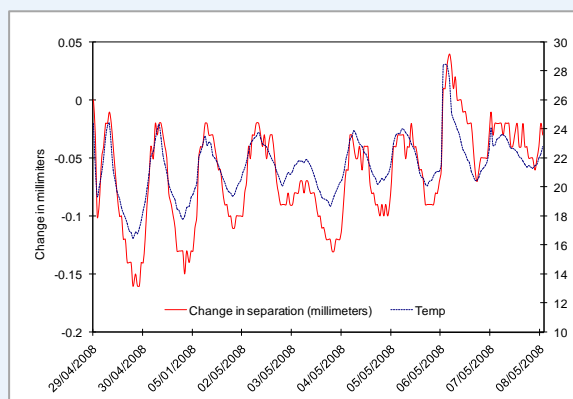
## Specifications

- ▲ **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*