YieldPoint *Sensing the future*

d-micro

YieldPoint's **d-micro** technology is a high precision digital strain-gauge that can monitor either discrete displacements (*i.e.* crack dilation) or distributed strains (i.e. stretch of a steel reinforcing element) to μm resolution.

The sensor is extremely thin (<7mm OD) and can easily be recessed down boreholes, attached to cables and bolts or embedded in shotcrete pillars The **d-micro** is easy to install by attaching to the #8-32 threaded rods at both ends of the sensor.

The RS485 output signal is an ASCII encoded message that includes the unique Sensor_ID, the Sensor_Type as well as the temperature and displacement values. This eliminates the necessity for expensive analog-to-digital conversion so that the low-cost readout unit outputs data in real world units (μm and °C). Readings can also be made using the USB port of a PC or web-book computer (SensorViewer). A Real-time *Plug 'n Play* network of d-micro sensors (or any other YieldPoint Instrument) can be built in minutes using DESTINY/IP. Long term, low power, data logging is possible using the low cost d-LOGGER solution.

These features make solutions based on d-micro instruments significantly more cost effective than those of competing products in the same marketplace.

Features:

- *10mm (0.4inch) stroke length*
- *High accuracy (0.25% FS) & resolution(0.01% FS)*
- *ASCII encoded RS485 Output signal*
- *Microcontroller provides output in real world units (μm and °C)*
- *Microcontroller stores Sensor_ID & Calibration Coeffs.*
- *Digital temperature sensor for accurate compensation*
- *Immunity to hostile environment*
- *High survivability to shock and vibration*
- *Easy to install and maintain and re-zero*
- *Low cost readout unit*
- *Plug 'n Play d-LOGGER*
- *Easy to interface with Ethernet and WiFi networks running TCP/IP*
- *Competitively priced*

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d-micro

Technology

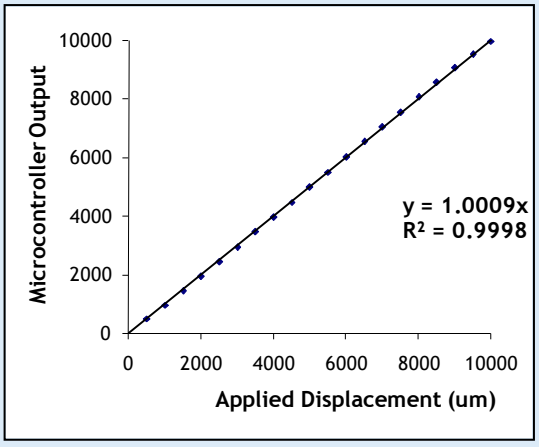
The d-micro strain gauge is capable of 1μm resolution over a range of 10mm. The gauge is attached to the structure using the #8-32 threaded rod at either end. The length of the sensor is 250mm and the diameter of the body is 7mm.

Signal Conditioning

An on-board microcontroller provides temperature compensation, applies a 10-point calibration algorithm, and outputs an ASCII encoded RS485 (9600,8,N,1) signal.

Output Signal

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 1000ft of lead-wire.



The relation between displacement and microcontroller output for d-micro (@ 20.3°C)

Telemetry

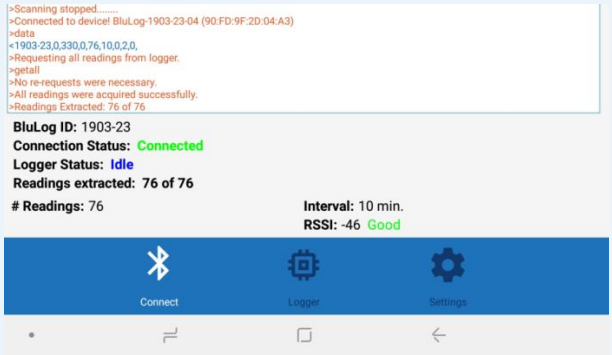
Manual Readout

Readout can be made using YieldPoint's low cost manual reader(d-Reader), with a backlit LCD. The Unit displays the Sensor_Type and Sensor_ID and outputs the displacement and temperature data directly in mm and °C.

BluPoint

Instruments can be wirelessly enabled using BluLink which provides a Bluetooth 5.0 connection which has a range of 100m LOS. BluLink can transmit data to BluGateways which are WiFi or LTE-M enabled. These devices can upload data to VantagePoint, YieldPoint's data aggregation and visualization tool.

BluLink also functions as a local data-logger storing 30,000 readings. Wireless download can be by any Bluetooth enabled Android device using the BluPoint app.



Telemetry

900MHz 1for1 Telemetry

For longer range deployments the d-Rebar operate with YieldPoint's 900MHz 1for1 mesh radio telemetry system. Individual radios have a LOS range of 300m.

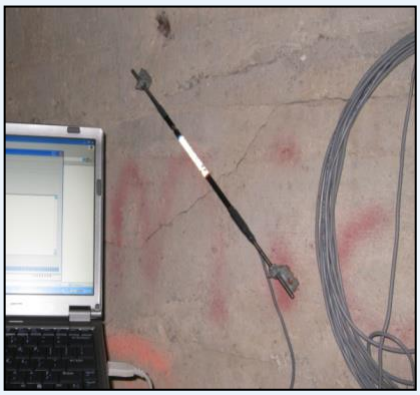
Fig 2: An installed 1 for radio

Fig 3: The 1for1 Gateway

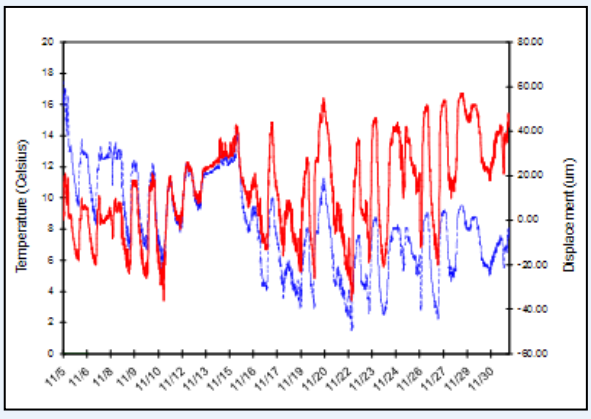
Applications

- Monitoring crack opening in buildings and structures.
- Monitoring crack opening in underground excavations.
- Monitoring concrete fracturing
- Monitoring the loading of structural elements such as posts and pillars
- Monitoring the loading of concrete columns or pillars
- Determining load in steel reinforcing elements.

Case Study



Measuring deformation across pre-existing fracture in a concrete access tunnel of a dam.



Measured displacements (red) for a d-micro on an external concrete wall exposed to diurnal temperature cycles (Blue). Recorded with d-LOGGER data-logger.

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Applications

Range (F.S.) – 10mm, Temp: -40 to 125°C

Core Technology - Eddy current transducer (oscillation Frequency 5 – 10,100Hz interfaced with microcontroller)
Digital temperature sensor

Output Signal –RS485 (9600,8,N,1) ASCII encoded signal comprising: Unique Instrument _ID, Sensor_Type, Temp and Displacement data

Displ. Resolution - 1μm with hand held readout.

Displ.Linearity - typically 0.5% F.S

Displ. Accuracy – better than +/- 100μm absolute or 50μm relative.

Temp. Range –40 – 125°C
Temp. Accuracy **+/- 2°C** –Digitally trimmed at 0°c and 25°C
Temp Resolution 0.1°C

Temp coeff for displacement sensor: <0.02%FS/°C (0-50°C)

Specification

Range (F.S.) – 10mm, Temp: -40 to 125°C

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