

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 $^{\circ}\text{C}$). 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. 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 $^{\circ}\text{C}$)
- ▲ 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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Technology

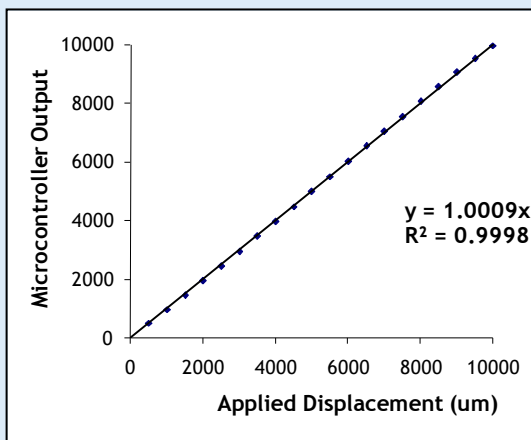
The **d-micro** strain gauge is capable of 1 μ m resolution over a range of 10mm. The gauge is attached to the structure using the #8-32 threaded rod at either end. The length of the sensor is 250mm and the diameter of the body is 7mm.

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 interrogation unit (MIU), 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.

The SensorViewer Module provides USB connectivity so that the **d-micro** can be read with using a Laptop or NetBook PC. If power is available a low cost NetBook computer can be transformed into a low cost data-logger.

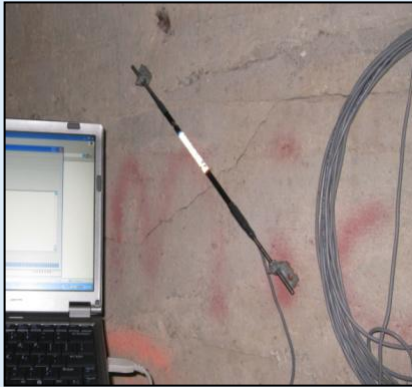
Automated Data Retrieval

The d-LOGGER (32Mb of memory) can collect up to 30000 readings from the **d-micro** over a period up to 1 year. Download to a PC is with a USB download cable (order separately).

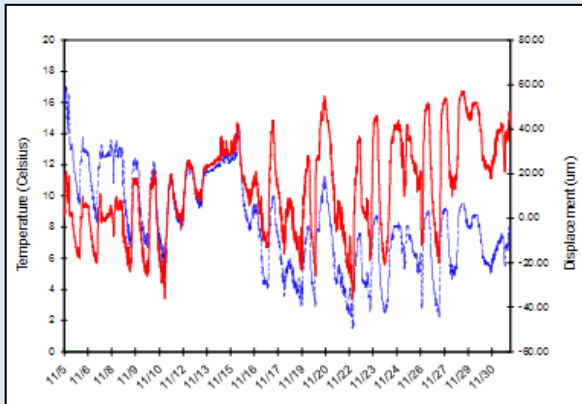
Plug 'n Play networks of instruments can be created using YieldPoint's **DESTINY** (digitally Enabled Sensor Transducer and Instrumentation Network from YieldPoint) technology. A low-cost **DESTINY** Slave can connect 4 instruments to a TCP/IP network over Ethernet or WiFi. This solution saves time and money by transmitting data directly to an engineer's desktop computer.

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.



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.

Specification

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

Core Technology: Eddy current transducer
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)