

## d-micro



YieldPoint's **d-micro** technology is a high precision digital crackmeter that can monitor either discrete displacements (*i.e.* crack dilation) or distributed strains (*i.e.* stretch of a steel reinforcing element) to  $\mu\text{m}$  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 3/8" UNC 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 ( $\mu\text{m}$  and  $^{\circ}\text{C}$ ).

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 or 1  $\mu\text{m}$ ).
- ▲ ASCII encoded RS485 Output signal
- ▲ Microcontroller provides output in real world units ( $\mu\text{m}$  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 d4BluLOGGER, d4BluGateway
- ▲ Easy to interface with Ethernet, WiFi BluGateways and LTE-M cellular networks
- ▲ BT5 compatible using BluPoint
- ▲ Competitively priced

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## Technology

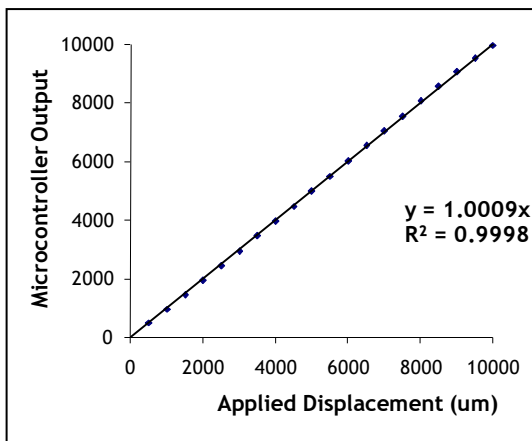
The d-micro strain gauge is capable of 1µm resolution over a range of 10mm. The gauge is attached to the structure using the 3/8UNC threaded rod at either end. The length of the sensor is 250mm and the diameter of the body is 7mm.

### 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

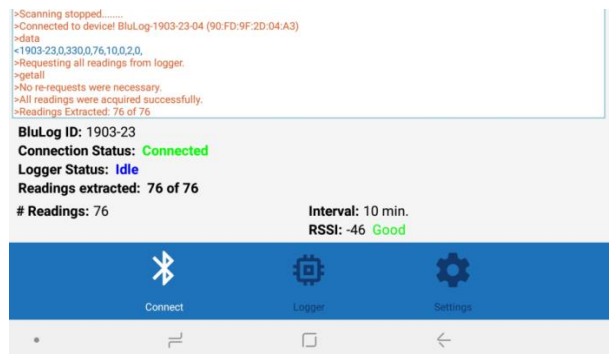
### Manual Readout

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

d-micro is compatible with all BluGateway products that offer (i) LTE-M and (ii) Ethernet/WiFi cloud backhaul.

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



Fig 2: An installed 1 for radio

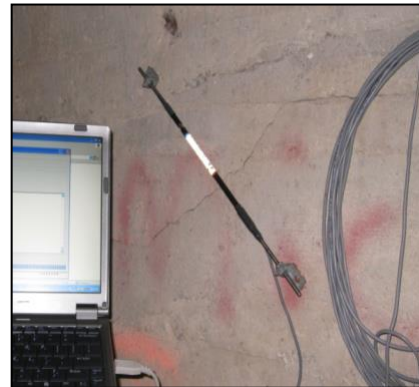


Fig 3: The d4BluGateway-LTE

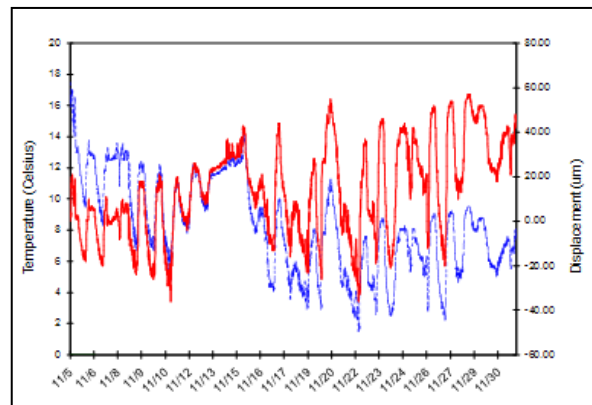
## Applications

- ▲ 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.

## Specification

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

**Core Technology** - LVIT (linear Variable Induction transducer) with proprietary temperature compensation. On board micro-controller.

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.

**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)

