YieldPoint Sensing the future

www.yieldpoint.com

BluEXTO

YieldPoint draws on its 20 years of experience designing high quality instrumentation and telemetry to present a paradigm shift for engineers designing large underground excavations. BluEXTO is the first genuinely wireless displacement monitoring solution, that integrates installation, measurement, signal processing, logging and telemetry complete with an 8-year battery capacity. The borehole extensometer is has up to 6 anchor points each with measurement resolution of 10 microns over ranges up to 250mm. BluEXTO is a derivative of YieldPont's dEXTO MkII design.

Integrated into BluEXTO head is a logger that can store 30,000 measurement, battery capacity for 8 years and a Bluetooth 5 radio modem which will *beacon* readings every 5 seconds with a range up to 100m. The device comes configured with a built-in PCB antenna. A whip antenna can be added for better range.

Integration includes a grout hose, a breather tube and a foaming tube which greatly simplifies the installation procedure. The diameter of the head is 57mm or 2.25" and the device is designed to be installed in 63mm or 2.5" boreholes (smaller diameters are possible).

The electronics head is designed to be recessed into the borehole (>50mm) for protection. Further protection (up to 50mm) of shotcrete can be added if blast damage is expected to be an issue.

Features:

- *1-6 anchor points.*
- *150-250mm (6-10 inch) stroke length with 0.01mm resolution.*
- *Output in real world units: mm.*
- *Robust design with filament wound fiber glass tube construction.*
- *Multiple Stainless Steel rods maintained straight in fiber glass tube for maximum accuracy.*
- *Materials chosen to minimize temperature sensitivity.*
- *High individual sensor linearity (>0.25%FS) with calibration sheet provided.*
- *Bluetooth 5 radio with 100m range (typical).*
- *On board storage of 30,000 readings downloadable with Android device.*
- *Arrive on site fully assembled and ready to install.*
- *Sealed body: Use with high w:c ratio grouts.*

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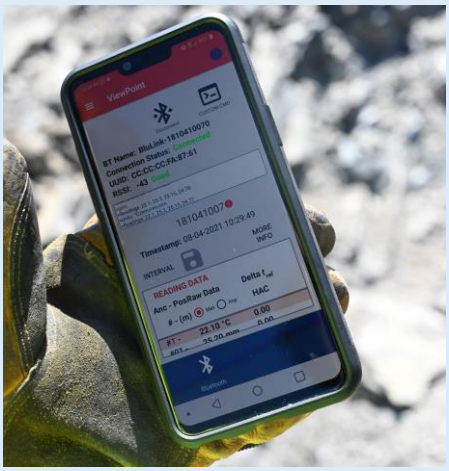
*Blu*EXTO

Extensometer Technology

The ***Blu*EXTO** design is based on a traditional multi-rod design (see below) which includes up to 6 LVIT (Linear Variable Inductive Transducer). The 6 custom stainless steel rods are housed individually in a custom filament wound fiberglass tube to maintain them perfectly straight and eliminate friction between rods. The individual rods are completely independent of one another and therefore if the distal rods are damaged by blasting the proximal sensors will continue to operate.

Each displacement sensor is individually calibrated and the calibration coefficients written to microcontroller memory. Blu**EXTO** can detect sub-mm displacements with 10μm resolution. Accuracy is enhanced by 2 reference sensors that provide temperature compensation. Second order compensation can be applied based on the onboard temperature sensor.

Onboard signal processing and linearization eliminates the cost of expensive analog-to-digital conversion. BluExto is also a data-logger with storage of 30,000 measurements which can be configured using the BluPoint App from an Android phone or tablet. BluExto will 'beacon' its readings every 5secs during its 8 year life-cycle.

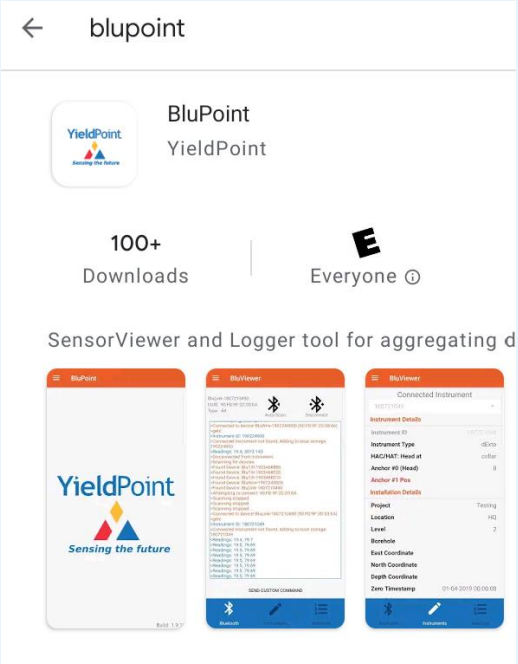


YieldPoint MPBX extensometers are also available for use in soil (road settlement) or in trenches (slopes).

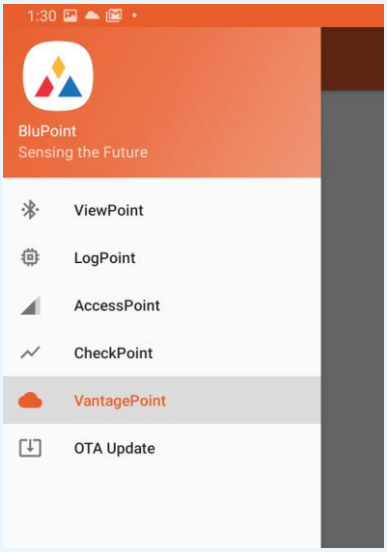
Telemetry

Bluetooth 5.0 : The BluPoint App

The BluPoint App (Android only) can be downloaded from the Google Store.

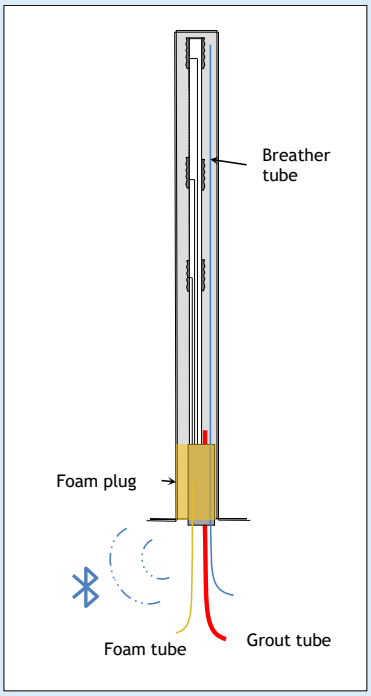


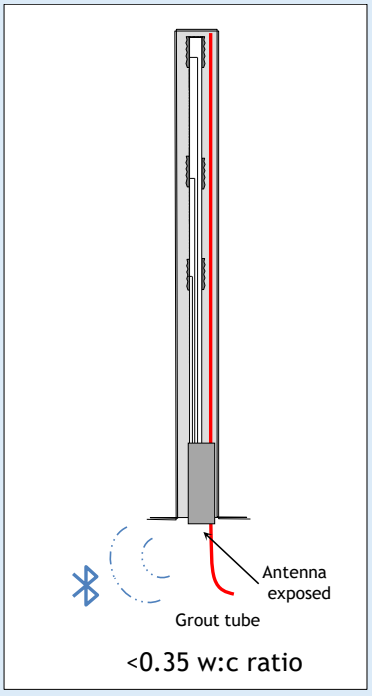
The BluPoint App comprises 5 activities that enable manual reading, data-logging, data backhaul (WiFi, LTE-M, Mini Sat) configuration.



Installation Options

BluEXTO comes packaged with all hoses and accessories for grouting. It can be pre-configured for either toe or collar grouting. For collar grouting (upper) this involved a Grout tube, a breather tube and a foam tube. For toe grouting (lower) only the grout tube is necessary and this runs to the toe of the instrument.





Installation Options

All models incorporate a PCB antenna and one of two additional options (i) an SMA connector for a whip or directional antenna, or (ii) an RS485 digital lead wire port. If survival during blasting is imperative the antenna can be covered with a layer of foam, cement or concrete.

For monitoring of backs and hanging walls in blasthole stopes various options exist to enable BluEXTO to survive during stope blasting. The data logging functionality allows stored data to be downloaded by a gateway device after some degree of access becomes available.

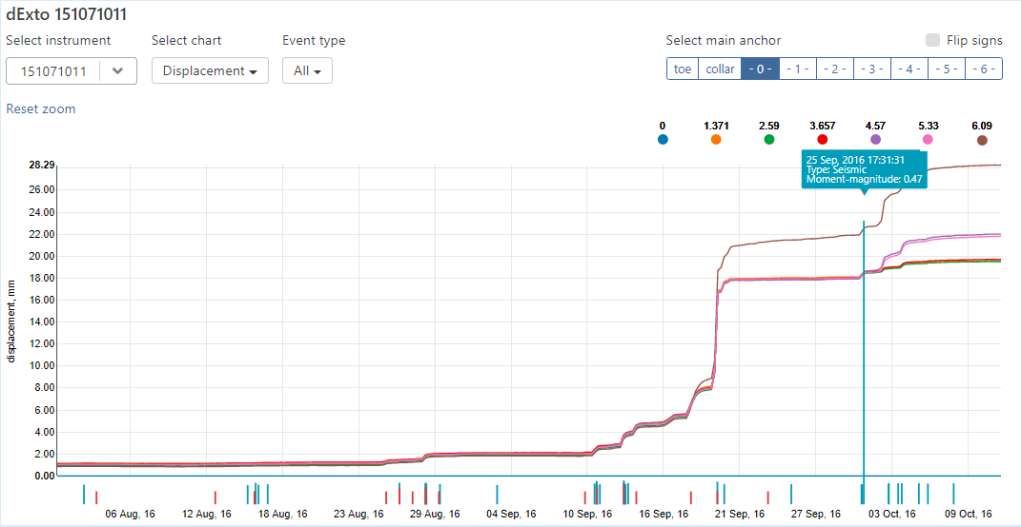
For the first time, engineers have a tool to monitor ground movements according in the vicinity of blasts and seismic events. For block cave mines BluEXTO is the first truly wireless ground movement monitoring system that can survive at drawpoints.

For depillaring applications, the beaconing technology allows remote readings and downloads at a range of 100m while limiting the risks due to fly-rock.

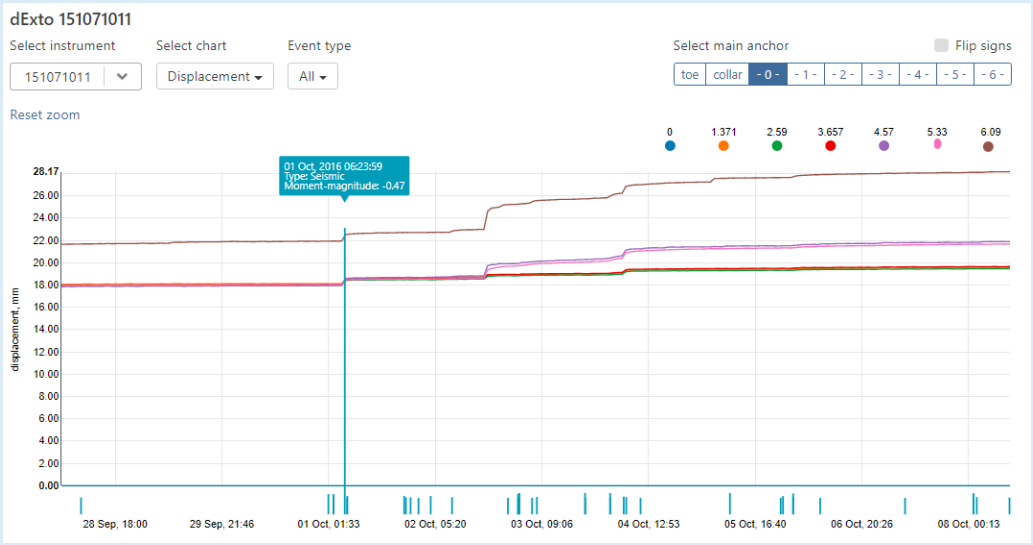
Value Proposition: Data Analysis using the Geotechnical Data Platform

YieldPoint has developed a Geotechnical Data Platform called **VantagePoint**, a powerful tool for aggregation, visualization and analysis of extensometer data. This web-based platform can accept data instantly pushed by all types of YP instruments.

The data analysis can be integrated with blasting and seismic data sets which enables engineers to develop an enhanced understanding of the mechanisms driving ground movements.

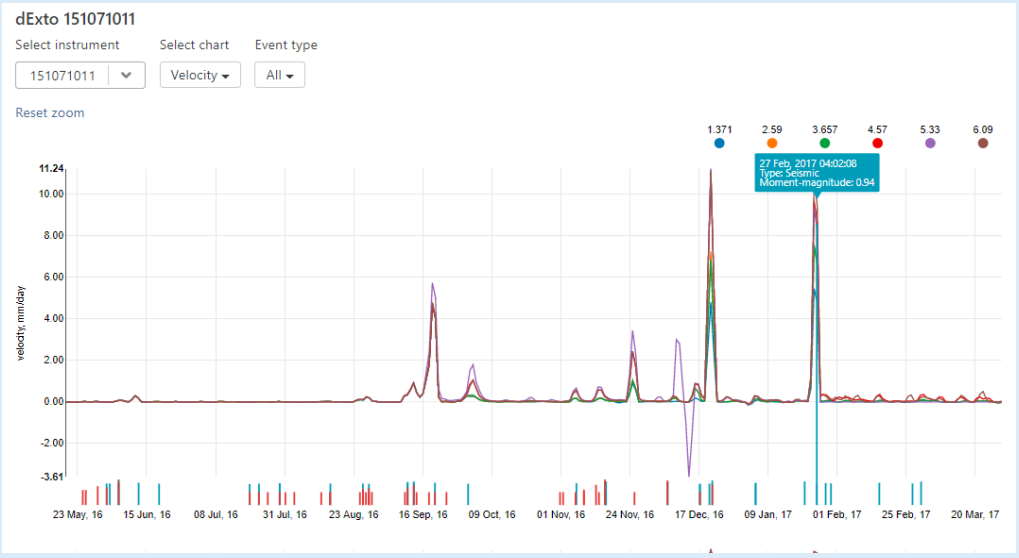


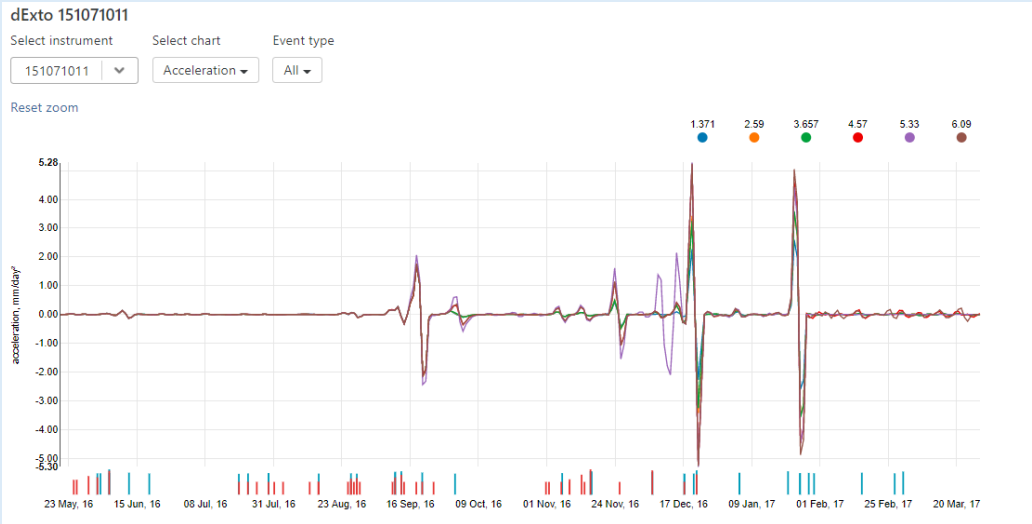
This software features a very powerful zooming capability that allows engineers to analyze the effect of individual blasts or seismic events. By establishing relationships between the magnitude and distance (concept of scaled distance) of events and the corresponding “micro-damage” to the walls of excavations, powerful predictive models can be developed.



Data Analysis using the Geotechnical Data Platform

In addition to Displacements, Velocities and Accelerations can be graphed. Blasts and Seismic Events can be correlated to spikes in Displacement Velocity. The height of the spike can be related to the "scaled magnitude" of the event.





Time Series Analytics can potentially be used to create forward looking predictions based on future planned blasting events. YieldPoint will work with customers to provide the GDP on a cloud platform or locally on a mine-site server

BluEXTO

Core Sensor Technology

- **Core Technology:** Up to 6 temperature compensated LVIT (Linear variable Inductance Transducers) Sensors: 0-250mm range. 1-wire Digital Temperature sensor.
- **Digital noise**: +/-0.02%FS
- **Resolution:** Fully 0.01mm with option to over-sample for micron scale resolution.
- **Linearity:** 0.25%FS typical better than 0.15% based on >10 point digital linearization.
- **Displacement Temp. Sensitivity:** Typically 0.02%FS. Effect can be reduced by recessing instrument head into borehole.
- **Repeatability:** Better than 0.25%.
- **Overall Accuracy:** The lesser of 0.35%FS or 0.5mm.
- **Temp. range**: Temp: -40 to 125°C.
- **Temp resolution:** 0.1°C.

Overall Instrument Performance

- **Key Feature:** Fully integrated and preassembled borehole extenso-meter, with datalogging and Bluetooth 5 radio.
- **Anchors:** 1 to 6, custom locations.
- **Dimensions:** Up to 45m (145ft). Straightens immediately once uncoiled. 63mm or 2.5" borehole
- **Instrument Specifications (Typical):**

  Thermal stability: Typ 0.02% FS/C
- **Temperature range**: -40 to 125°C
- **Output Signal:** RS485 with transmission up to 500m over 2 x tp.
- **Output Signal**: An RS485 synchronous serial signal: 9600,8,N,1. ASCII encoded. Values and units transmitted.
- **Data-logging**: 30,000 measurements
- **Radio frequency**: 2.5GHz Bluetooth 5 with Coded PHY. Beaconed measurements every 5secs.
- **RF range**: Typically 100m LOS. Up to 500m with directional antenna. Star Configuration. 25m range to Android devices running BLE 4.2.

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