Bassett Convergence System

Applications

The measurement of δx and δz in structures and tunnels:

- Monitoring of live railway tunnels during operating hours
- Control of tunnel deformation
- Monitoring movement of shotcrete tunnel linings

Operating Principle

The Bassett Convergence System is designed to measure delta X and delta Z deformations, in near real time in structures.

Primarily used in tunnels, particularly those such as illustrated below where clearances are extremely small, the system is robust, simple and proven.

The Soil Instruments Bassett convergence system uses pairs of solid state servo sensors arranged within short and long arms to provide δx and δz data in mm of a tunnel or other structure.

The system is supplied complete with a datalogger and Soil Instruments software to display data both as a graphical representation of the tunnel and with X & Z graphs for each point. The full I-Site alarm functionality can be built into the BCS system, please see datasheet D2 for full details.

The Soil Instruments Bassett Convergence System is the only system officially authorised and endorsed by Dr Richard Bassett it's inventor. A paper has been published on the system by the Institution Of Civil Engineers in London, who awarded their Halcrow prize to the authors. This paper describes the system in detail and is available from Soil Instruments.

The Soil Instruments Bassett system can also be installed using Soil Instruments Cable Free digital radio system, significantly quickening installation time and removing the need for any cables .

Advantages and Limitations

- Very low profile system can be fitted in areas of minimum clearance such as live railway tunnels.
- Low cost, simple, rugged sensor technology requiring very low power to read.
- Gives a complete δx and δz profile.
- Must be automated via data acquisition and I-Site software.
- Very well established track record on major projects across the world.
- Care must be taken during installation to maximise performance.

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DATA SHEET TLT3

Specification

TLT3 Bassett Convergence System

TLT3-1 and TLT3-2.2 Solid State Servo Sensor

▪ The same sensor is used for both the long and short arm of the system. Two sensors per air pair are required. e.g. for a system with 7 long/short arms, 14 sensors are required. The sensor contains a 'bubble' level which is used to align and zero it during installation (note. no readout required)

TLT3-2.2 Long Arm Sensor Mount

▪ Mount to take sensor to position onto stainless steel long arm beam. One per long arm required

TLT3-1.1 Short Arm Sensor Mount

▪ Complete short arm, with pivot points.

TLT3-3.4 Long Arm

▪ 15mm round section extruded stainless steel beam, supplied in nominal 2 metre lengths, must be cut and radiused on site.

TLT3-3.2 Anchor Kit and Mounting Pin

▪ One kit per pair of long/short arms required. Standard kit included 'L' bracket to enable system to be aligned along the axis of a tunnel.

TLTCF Digital Radio Option

See Soil Datasheet TLT-CF. One radio per sensor required. Includes mounting bracket to attach radio transmitter to the sensor mount.

CA-1 Cable:
▪ 4 core cable with overall foil, braid and drain wire to Belden 9927 specification. Polyurethane jacket as standard, low smoke, zero Halon on request Only required if the Bassett system is to be read with a Campbell Datalogger. For systems read with the Digital Radio System, no cables are required

CR10 Datalogger

For systems where the sensors are cabled, see Soil Instruments datasheet D1 for more details.

Radio Logger

For use with Digital Radio transmitters, see Soil Instruments datasheet TLT-CF for details

2. Sensor Performance

Solid State Sensor

Solid State tilt sensor with inbuilt temperature compensation.

Range:

▪ ±130mm/metre (approx ±7.5 arc degrees)

Resolution:

Dependant on readout used, sensor better than 5 arc seconds (0.0025 mm/metre). Sensor and Campbell CR10 better than ±15 arc seconds (0.072mm/metre) Sensor and digital radio better than ±10 arc seconds (0.048mm/metre)

Repeatability:

Dependant on readout used, sensor better than 10 arc seconds (0.0485 mm/metre). Sensor and Campbell CR10 better than ±30 arc seconds (0.14mm/metre) Sensor and Digital Radio better than ±20 arc seconds (0.097mm/metre)

Accuracy:

Dependant on readout used, sensor better than 10 arc seconds (0.0485mm/metre). Sensor and Campbell CR10 better than ±45 arc seconds (0.21mm/metre) Sensor and digital radio better than ±20 arc seconds (0.097mm/metre)

Temperature:

The solid state servo sensor contains a microprocessor and look up table that provides temperature compensation to its tilt output.

3. Ordering Information (Bassett System Only, please see separate datasheets for readout options)

TLT3-1.2/2.2 Solid State Servo Sensor

TLT3-1.2/2.2 Solid State Servo Sensor, 2 required for each 'node' of the system

TLT3-2.2 Long Arm Sensor Mount

TLT3-2.2 Long Arm Sensor Mount, one per long arm required

TLT3-3.4 Long Arm

TLT3-3.4 Long Arm, supplied in nominal 2 metre lengths, other lengths on request

TLT3-3.2 Anchor Kit and Mounting Pin

TLT3-3.2 Anchor Kit and Mounting Pin, one per pair of sensors required. Please discuss any special mounting arrangements with Soil Instruments

CA-1 Cable

CA-1-4-S 4 core screened cable

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