DATASHEET

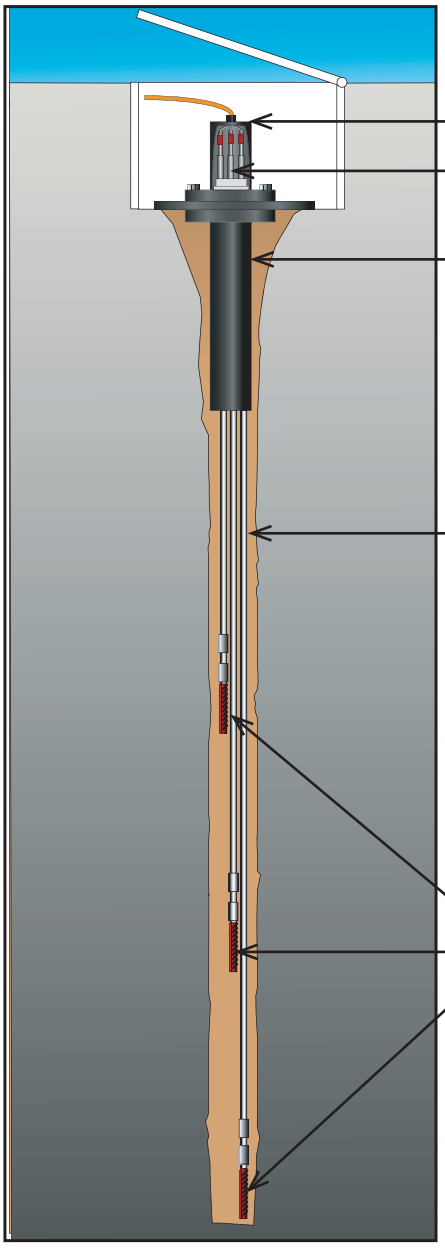
Borehole Rod Extensometer GEO-XB2 Range

The Geosense® GEO-XB2 borehole rod type extensometer range is used to measure and locate settlement, displacement and deformation in soil and rock

GEOSENSE

Borehole Rod Extensometer GEO-XB2 Range

Overview



APPLICATIONS

For the measurement of:

- Deformation of dam abutments & foundations
- Ground movement around tunnels & mines
- Ground movement behind retaining walls & sheet piles
- Ground movement within open cast mines
- Deformation of mine pillars
- Fracturing in roofs of underground caverns
- Deformation of concrete piles
- Settlement & heave in soft soil excavations

FEATURES

- Quick & easy to install even in up-hole applications
- Easy access & adjustment to sensors
- Mechanical & electrical options
- Low profile
- Accurate & reliable

The Geosense® GEO-XB2 borehole rod type extensometer range is used to measure and locate settlement, displacement and deformation in soil and rock.

It consists of a reference head and one or more in-hole anchors each of which is placed at a known depth and connected to the reference head by either a rigid or flexible rod running inside a flexible sleeve, which keeps the rod de-bonded from the grout.

As the soil or rock deforms the distances between the in-hole anchors change, as do the distances between the individual in-hole anchors and the reference head. The magnitude, distribution and rate of deformation can be accurately measured at the reference head.

The GEO-XB2 rod type extensometer range is available in a wide range of reference heads, anchors, rods and measuring sensors.

Borehole Rod Extensometer GEO-XB2 Range

Measurement & Reference Heads

MEASUREMENT is available in the following options:

MECHANICAL

Reading is carried out using a dial indicator or depth micrometer.

ELECTRICAL

Reading is carried out using an electrical displacement gauge (Vibrating Wire or Linear Potentiometer).

REFERENCE HEADS are available in the following types

MECHANICAL

Can be used where there is easy access to the extensometer and automatic readings are not required.

GXB2-M : MECHANICAL

The rod(s) terminate in the reference head block where manual readings are taken with a digital depth gauge. The head is normally installed more or less flush with the top of the borehole.

ELECTRICAL

Used when access to the reference head is difficult or where continuous monitoring is required. The rod(s) are connected to an electrical sensor. Movements are measured by converting the signals to a measurement of length change.

GXB2-VW: ELECTRIC VW SENSOR

A one-part head where the rods connect to the linear displacement gauges which are mounted on the internal flange within the head and protected by a one piece outer cover.

The head is mounted with all the sensors and rod connections located entirely within the head itself. All sensors can be completely accessed post installation by removing the outer cover. The length of the head will depend on the range of the sensor.

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Reference Heads & Electrical Displacement Sensors

REFERENCE HEADS All GEO-XB2 reference heads can be use with either flexible or rigid rods & sleeves (see table).

Type	Reference head type	Measurement sensor	Rod type	No of points
GXB2-M-R	Mechanical	Rod	Rigid	1 - 6
GXB2-M-F	Mechanical	Rod	Flexible	1 - 6
GXB2-VW-R	Automatic	Vibrating wire	Rigid	1 - 6
GXB2-VW-F	Automatic	Vibrating wire	Flexible	1 - 6
GXB2-LP-R	Automatic	Linear potentiometer	Rigid	1 - 6
GXB2-LP-F	Automatic	Linear potentiometer	Flexible	1 - 6

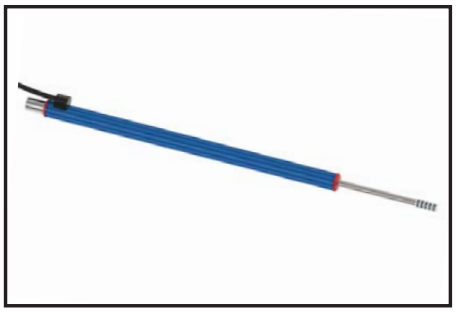
Other options available on request

ELECTRICAL DISPLACEMENT SENSORS are available in the following types

VIBRATING WIRE DISPLACEMENT GAUGE

LINEAR POTENTIOMETER

VW DISPLACEMENT GAUGE



LINEAR POTENTIOMETER

Borehole Rod Extensometer GEO-XB2 Range

VW Displacement Gauge VWDT-5000

DIMENSIONS

Model	Range (mm)	Length Compressed (mm)	Length Extended (mm)	Diameter (mm)
VWDT-5001[1]	5	200	204	13
VWDT-5002	12.5	213	224	13
VWDT-5003	25	262	283	13
VWDT-5004	50	293	338	13
VWDT-5005	75	387	454	13
VWDT-5006	100	418	508	13
VWDT-5007	150	548	683	13
VWDT-5008	200	678	858	13
VWDT-5009	300	935	1205	13
VWDT-5010[2]	500	1451	1901	13

PERFORMANCE

Resolution	<0.025% FS
Accuracy	±0.1% FS
Nonlinearity	<0.5% FS

ELECTRICAL

Frequency range	1650-2700 Hz
Nominal zero value	1850 Hz

MECHANICAL

Operating temperature range	-20 °C to +80°C
Body material	Stainless steel
Inner rod	Stainless steel
O-ring	Viton
Waterproof rating	IP68 (16 bar)
Cable	2 pair PUR sheath
Cable Type	Type 900 - VW Sensor with Foil Screen & Drain Wire

ORDERING INFORMATION

Range	
Anchor type	
Readout type	

[1]Available on request [2] Gauge not retrievable

Borehole Rod Extensometer GEO-XB2 Range

Linear Potentiometer Displacement Gauge LPDT-5500

DIMENSIONS

Model	Range (mm)	Length Compressed (mm)	Length Extended (mm)	Diameter (mm)
LPDT-5501	25	127	154	13
LPDT-5502	50	152	204	13
LPDT-5503	75	177	254	13
LPDT-5504	100	202	304	13
LPDT-5505	125	227	354	13
LPDT-5506	150	252	404	13
LPDT-5507	175	277	454	13
LPDT-5508	200	302	504	13

PERFORMANCE

Resolution*	0.01% FS with MP12 readout
Accuracy	< ±0.20% FS
Repeatability	<0.01mm
Nonlinearity	≤0.5% FS

ELECTRICAL

Technology	Conductive plastic
Voltage	6-30VDC
Output	4-20mA
Cable	26 AWG x 3 conductor, FDR 25 sleeve

MECHANICAL

Temperature range	-30 °C +125 °C
Protection class	IP67
Body Material	Anodised aluminium
Enclosure Shaft	Stainless steel
Enclosure	IP67

* Readout dependent, may alter with other readout types.

ORDERING INFORMATION

Range	
Cable length	
Readout	

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Rods & Sleeves

RODS

Rods are used to connect the anchors to the reference head and are available in rigid or flexible form

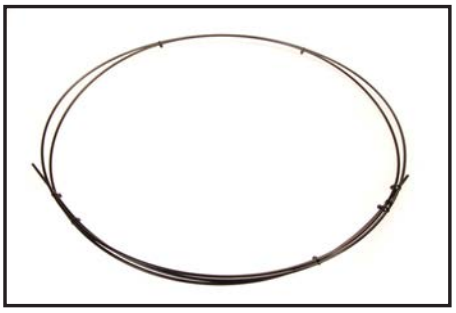
RIGID

Made from stainless steel and come in short lengths of 1,2,3 metre with flush threads. A starter rod is connected to the anchor.

FLEXIBLE

The fibreglass rods are a continuous length factory produced to meet the project requirements.

RIGID



FLEXIBLE

Material	Diameter	Young's Modulus	Expansion Coefficient	Lengths
Stainless Steel	6mm	200 GPa	16.0 ppm/°C	1, 2, 3m
Fibreglass	5mm	20 GPa	3.0 ppm/°C	1, 2, 3m, continuous

SLEEVES

Sleeves allow the rods to move freely and prevents bonding of the rod and grout.

Made from flexible nylon available in short lengths with external couplers they can be used with the rigid rods or a continuous length for use with the flexible rods. Flexible rods and sleeves are pre-assembled at the factory to allow quick and easy installation on site.

SLEEVES

Continuous 10mm flexible sleeve

10mm x 1m flexible sleeve

10mm x 2m flexible sleeve

10mm x 3m flexible sleeve

10mm coupler

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Anchors

ANCHORS

Anchors are located at various depths within the borehole and connected to the rods. The choice of anchor will depend on the surrounding ground and are available in the following types:

Groutable (Pic 1) Generally used in downward-directed boreholes. Used in compact rock and non-cohesive soils. Installed in the borehole and then grouted.

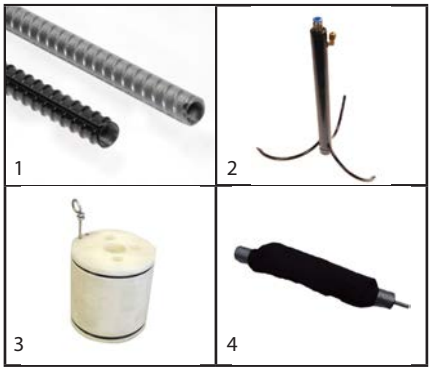
Hydraulic (Pic 2)
Borros Type for use in soft soils and clays, especially in augered boreholes.
Drives prongs into the soil using hydraulic pump. Available in single or double options.

Snap ring (3) For use in hard or competent rock. Anchors are pushed to the required depth and then a cord is pulled to remove the locking pin. Retaining rings on each anchor snap outward and grip the borehole. Particularly useful in upward directed boreholes.

Packer type (4) Used in soft soil conditions, granular materials and are used typically in up-hole installations. Inflated with cement by an injection tube.

ANCHOR TYPE	CONNECTION
16mm Groutable anchor	Flexible sleeve
16mm Groutable anchor	BZP Flexible sleeve
Snap ring anchor*	Flexible sleeve
Packer anchor	Flexible sleeve

* Diameter to suit individual borehole (± 1 mm accuracy of bore required)



PACKER ANCHOR

GXB Packer Anchors are used when it is important that the surrounding strata between anchors are not affected by grout.

The borehole between each anchor is left open or filled with compressible material meaning the anchors are insensitive to shear displacements. This ensures no interference and reduces the amount of grout needed compared to groutable anchors.

The anchors consists of thin-walled steel pipe 600mm long with an internal grout port and a geotextile filter sleeve. By injecting cement grout into the annulus of the tube and the geotextile, the sleeve is expanded and, once set, locks directly into the borehole wall. The geotextile filter ensures the cement is retained within the annulus and the water of the injection can flow through. This also avoids any grout loss in fissured rock.

TYPE	NO OF ANCHORS	BOREHOLE ∅	LENGTH	INSIDE ∅	OUTSIDE ∅ DEFLATED	OUTSIDE ∅ INFLATED	WEIGHT
PA3	1 - 2	65 - 90mm	600mm	45mm	58mm	90mm	1.95kg
PA4	3 - 4	90 - 120mm	600mm	73mm	80mm	120mm	2.74kg
PA5	3 - 4	110 - 145mm	600mm	86mm	100mm	145mm	2.75kg

GROUT MIX

It is recommended to use 25kg cement and 20 litres of water.

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Accessories & Readouts

ACCESSORIES

- Installation kit
- 16mm x 30m coil grout tubing
- Hydraulic pump & hose
- Cable Type 900 - VW Sensor with Foil Screen & Drain Wire; Type 910 - Multi-core with Foil Screen & Drain Wire

READOUTS

- 0 - 200mm digital depth gauge (Pic 1)
- VWR1 readout (Pic 2)
- MP12 Readout (Pic 3)
- Geologger Linx (Pic 4)

ORDERING INFORMATION

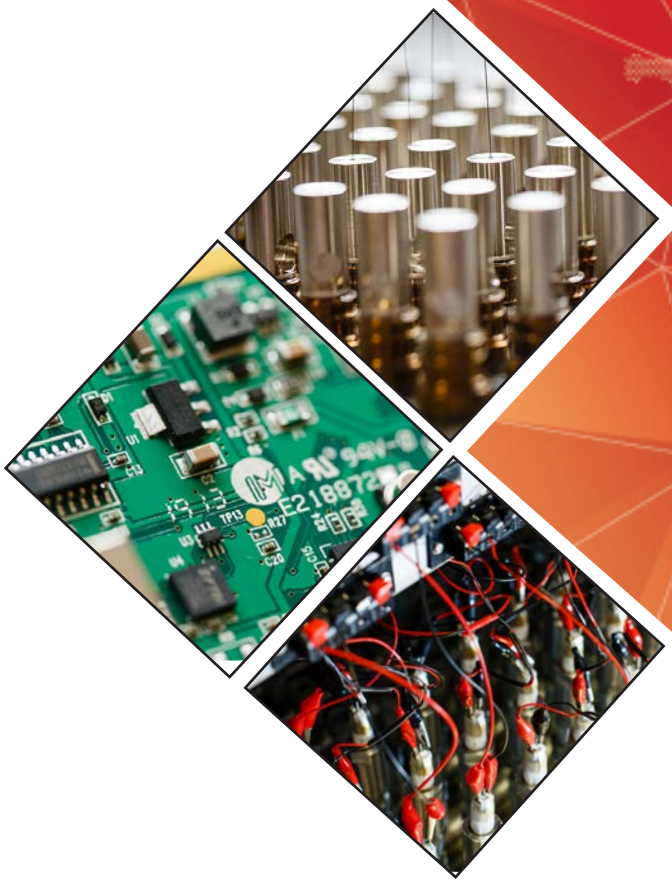
- Reference head type
- Sensor type, range and quantity
- Anchor type & quantity
- Distance between anchors
- Rod type & quantity
- Readout type


1


2


3

4



Geosense Ltd, Nova House, Rougham Industrial Estate, Rougham, Bury St Edmunds, Suffolk IP30 9ND, England

www.geosense.co.uk e sales@geosense.co.uk t +44(0)1359 270457

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