

E10 ROD EXTENSOMETER

Datasheet E10



**Description**

The Rod Extensometer system accurately measures settlement and/or heave between single or multiple anchor points in a borehole and at its reference head.

The system employs up to eight rods, anchored along the axis of a borehole, terminating in the reference head at the borehole entrance.

The Rod Extensometer is isolated from the backfill material by a protective sleeve that ensures its free movement.

Displacement along the axis of the borehole from the anchor is recorded by measuring movement of the top of the rod relative to the reference head.

There are a versatile range of options for Rod Extensometers:

- Automatic or manual reading
- Rods made from Stainless Steel or fibreglass
- Hydraulic anchoring for soil
- Groutable anchoring for rock
- Multiple or single point rod reference

**Features**

- Supplied in component form for on-site assembly
- Choice of Stainless Steel or fibreglass rods
- Various anchor types available according to soil conditions and installation method
- Remote option uses Vibrating Wire or potentiometric displacement transducers
- Up to 8 anchors can be installed at various depths in a borehole
- For borehole diameters up to 200mm

**Benefits**

- Installation in drillholes or boreholes at any orientation
- Manual or remote monitoring
- Depth gauges can be used for manual reading
- Easily adaptable rod lengths to suit variable site conditions
- Operating lengths in excess of 100m possible
- Can be configured for remote reading and data logging



Comprehensive information about this product and our full range is available at [www.soilinstruments.com](http://www.soilinstruments.com)  
If you would like to speak with someone directly please call +44 (0)1825 765044 or email [sales@soilinstruments.com](mailto:sales@soilinstruments.com)

## Operation

Relative movement between the end anchor and the reference tube is measured with either a dial depth gauge or a displacement transducer. The displacement transducer is installed in the reference tube and connected to the free end of the rod; the other end of the rod has one of two anchors connected.

The ground condition determines the type of anchor to use:

- Groutable anchors for down-hole installation in rocks
- Hydraulic type anchors (single or double ended) for soft soils
- Packer anchors for jointed rocks, where there is flowing water, or up-hole installations

The extensometers have reference heads with provision for up to eight measuring points per borehole. Borehole diameters may be in the range of 100mm-200mm.

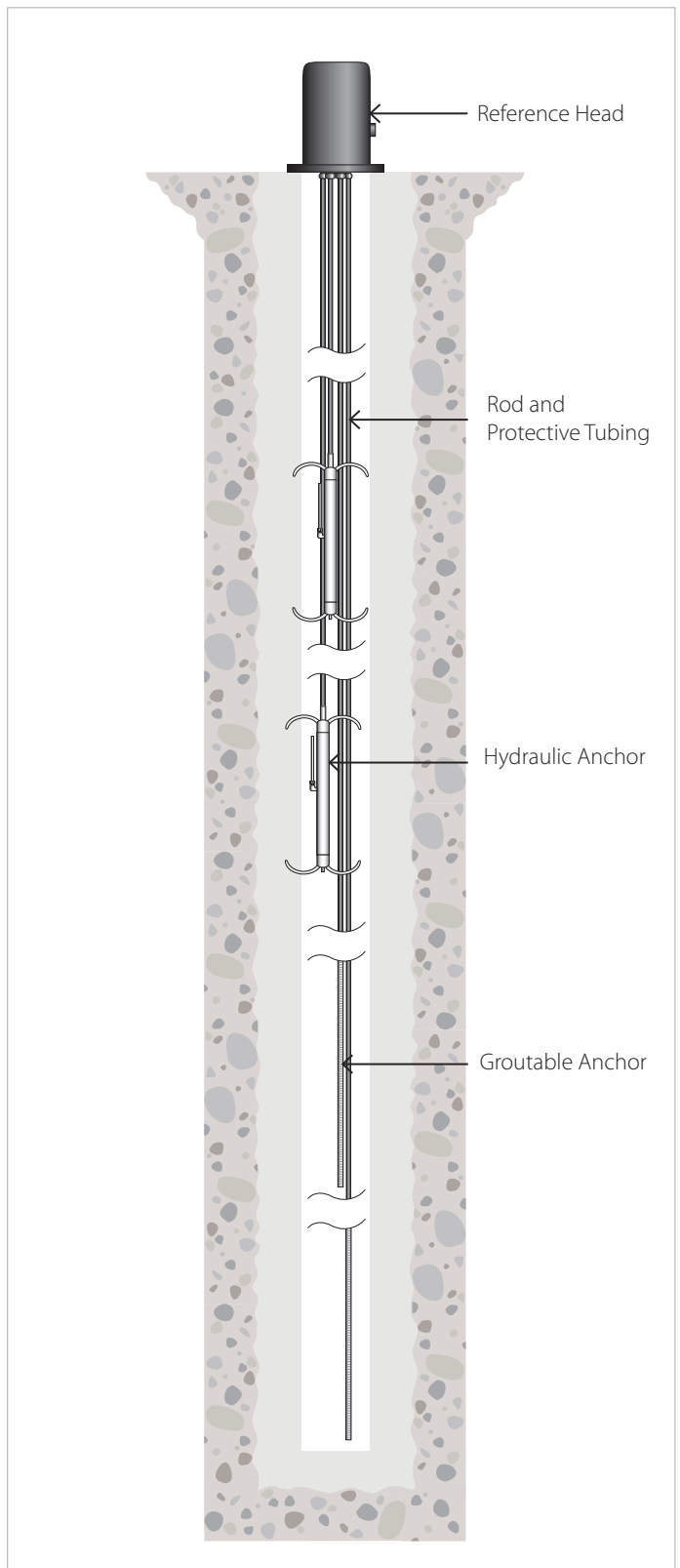
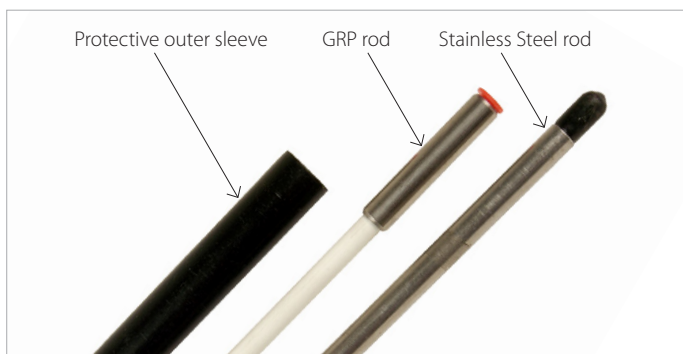
Use Stainless Steel rods for greater depth range, or fibreglass rods for quicker installation at shorter depths. A multipoint reference housing receives all rods from the one borehole installation.

## Applications

Rod Extensometers are used to monitor small scale rock and soil movements to a high degree of accuracy, including settlement and heave of foundations, the relaxation or subsidence of rock around tunnels, shafts, caverns and abutments.

Typical applications include:

- Monitoring settlement and heave in foundations
- Monitoring tunnels, shafts, caverns and abutments
- Control of natural and cut slopes, quarry and mining excavations
- Monitoring deformation of retaining walls, bridge piers and abutments
- Dam and intake tower foundations, concrete dam abutments



### THE TECHNICAL RATING FOR THIS PRODUCT:

As the correct installation of any monitoring sensor or system is vital to maximise performance and accuracy, Soil Instruments makes the following recommendations, for the skill level of the installation contractor.

#### ADDITIONAL SUPPORT

We offer installation and monitoring services to support this system. For more information please email : [sales@soilinstruments.com](mailto:sales@soilinstruments.com) or call : **+44 (0) 1825 765044**

#### ADVANCED



#### ADVANCED



The installer is trained and experienced in the installation of this type of instrument or systems, and is ideally a specialist Instrumentation and Monitoring contractor.

#### INTERMEDIATE



The installer already has previous experience and/or training in the installation of this instrument or system.

#### BASIC



As a minimum the installer has read and fully comprehends the manual, and if possible has observed these instruments or systems being installed by others.

## Specifications

### Vibrating Wire Transducer

Ranges	30mm	50mm	100mm
Resolution <sup>1</sup>		0.025% full scale	
Accuracy		±0.2% full scale	
Temperature range		-20 to +80°C	
Thermistor type		NTC 3k Ω	
Thermistor accuracy		±0.5°C	
Thermistor resolution <sup>1</sup>		0.1°C	
Weight less cable	190g	212g	254g
Dimensions <sup>2</sup>	290mm x Ø19mm	340mm x Ø19mm	450mm x Ø19mm
Excitation method		Pluck or sweep	
Material		316 grade Stainless Steel	
Ingress protection		IP68 to 1700kPa	

### Readout System

Type	Dial Depth Gauge	Digital Depth Gauge
Range	50mm	25mm
Resolution <sup>1</sup>	0.01mm	0.01mm
Accuracy	0.05% full scale deflection	0.03% full scale deflection

### Rods

Material	Stainless Steel	Fibreglass
Temperature coefficients	17.5ppm/°C	3ppm/°C
Diameter	8mm	6mm
Lengths		1m   2m   3m
Maximum no. rods		8 (manual) / 6 (remote)

### Anchors

Type	Groutable	Hydraulic – single action or double action
Material	Zinc plated steel	Steel
Diameter	16mm	32mm
Length	540mm	450mm (single) / 820mm (double)
Borehole diameter range	n/a	75mm, 100-200mm
Maximum number of anchor points		8

### Sleeves

Material	PVC
Lengths	1m   2m   3m
Inner diameter	9.6mm
Outer diameter	16.7mm

<sup>1</sup> Dependent on readout. <sup>2</sup> In the closed position

## Ordering Information

### Anchors

E10-1.1	Groutable anchor unit; fits rods E10-2.1 to E10-2.6, includes PVC extension to fit sleeves E10-2.10 to E10-2.12
E10-1.20	Hydraulic anchor, single action; Ø75mm borehole, for use with hydraulic tubing ¼inch W6-2.9
E10-1.21	Hydraulic anchor, double action; Ø75mm borehole, for use with hydraulic tubing ¼inch W6-2.9
E10-1.22	Hydraulic anchor, single action; Ø100–200mm borehole, for use with hydraulic tubing ¼inch W6-2.9
E10-1.23	Hydraulic anchor, double action; Ø100–200mm borehole, for use with hydraulic tubing ¼inch W6-2.9
W6-2.9	Hydraulic tubing; black, ¼inch, priced per metre
W6-3.20	Male quick release coupling; ¼inch
W6-3.5	Spare nut and olive; Enots ¼inch
W6-3.7	Straight coupling; Enots ¼inch, for in-line hydraulic tube connection and repair
E10-3.17	Hydraulic hand pump; includes female quick release coupling and pressure gauge
P8-3.8	Hydraulic oil; priced per litre

### Rods and Sleeves

E10-2.1	Extensometer Stainless Steel rod; 1 metre length
E10-2.2	Extensometer Stainless Steel rod; 2 metre length
E10-2.3	Extensometer Stainless Steel rod; 3 metre length
E10-2.4	Extensometer fibreglass rod; 1 metre length
E10-2.5	Extensometer fibreglass rod; 2 metre length
E10-2.6	Extensometer fibreglass rod; 3 metre length
E10-2.10	Protective sleeve; 1 metre length
E10-2.11	Protective sleeve; 2 metre length
E10-2.12	Protective sleeve; 3 metre length

## Ordering Information

### Range Adjustment Unit for Manual Reading

**Stainless Steel tube with internal thread. Provides 150mm adjustment**

E10-2.13-1	For Stainless Steel rods
E10-2.13-2	For fibreglass rods

### Rod Adapter Unit for Remote Reading

E10-2.14-1	For Stainless Steel rods
E10-2.14-2	For fibreglass rods

### Head Fixtures

E10-3.1	Single rod reference head; manual reading
E10-3.2	Single rod reference head; remote reading
E10-3.3	Multiple rod reference head; up to 8 rods, manual reading
E10-3.4	Multiple rod reference head; up to 6 rods, remote reading

### Installation Equipment

E10-4.12	Installation tool kit; tool box includes hand drill, 1.5mm diameter drill, knife, steel rule, screwdriver, mole grips, file, 6mm Allen key, spanner 12/13mm, adjustable spanner, combination pliers, junior hacksaw and spare blades
W3-4.8	Tube cutter
E10-4.4	Range adjustment tool; nut spinner to adjust E10-2.13 for manual reading
E10-4.5	Range adjustment placing tool; for adjusting E10-2.13-1 and E10-2.13-2
E10-4.6	Sleeve support/clamp unit – manual reading; for reference head E10-3.3, at least one required as installation tool
E10-4.7	Sleeve support/clamp unit – remote reading; for reference head E10-3.4, at least one required as installation tool
E10-4.8	Grout pipe; 19mm OD nylon braided PVC hose, priced per metre
E10-4.9	Air bleed/grout return pipe; 3/8in OD PVC pipe
W6-4.1	PVC adhesive – 250ml; sufficient for approx. 150 joints
W6-4.2	Metal adhesive; for securing threaded joints, sufficient for approx. 200 joints
W6-4.4	Polyester resin cartridge; 150ml, to fix anchor into drill hole
W6-4.5	Cartridge injection tool
W6-4.6	PVC cleaner; to prepare joints of sleeves, sufficient for approx. 200 joints

### Connecting Cable and Fittings

CA-3.1-4-IC	Instrument cable, 4 core, 7/0.20, screened; polyurethane jacket, priced per metre
CA-2.3-12-SC	12 core, multicore cable, 16/0.20, screened; PVC jacket, priced per metre
CA-2.3-25-SC	25 core, multicore cable, 16/0.20, screened; PVC jacket, priced per metre
CA-4.1	Joint sealing kit
CA-4.2	Coloured adhesive tapes; set of 10No.
CA-4.3	Crimping tool
CA-4.4	Crimping sleeves; set of 100No.
W6-6.1	Nylon ties; 150mm x 3.5mm, pack of 100No.
ST1-3.5	Nylon ties; 370mm x 4.7mm, pack of 100No.

### Readout Equipment

E10-6.1-50	Dial depth gauge; range 50mm
E10-6.1-100	Dial depth gauge; range 100mm
E10-6.2	Digital depth gauge; range 25mm
E10-6.5-T	Vibrating Wire displacement transducer; range 30mm with thermistor and termination cable to reference head
E10-6.3-T	Vibrating Wire displacement transducer; range 50mm with thermistor and termination cable to reference head
E10-6.4-T	Vibrating Wire displacement transducer; range 100mm with thermistor and termination cable to reference head

### Manuals

MAN-12	Rod Extensometer
MAN-144	Rod Extensometer with Vibrating Wire Displacement Transducer

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