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.itmsoil.com
If you would like to speak with someone directly please call +44 (0)1825 765044 or email sales@itmsoil.com

PRECISELY MEASURED
instrumentation and monitoring
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

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.

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.

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

THE TECHNICAL RATING FOR THIS PRODUCT:

<table>
<thead>
<tr>
<th>Skill Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADVANCED</td>
<td>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.</td>
</tr>
<tr>
<td>INTERMEDIATE</td>
<td>The installer already has previous experience and/or training in the installation of this instrument or system.</td>
</tr>
<tr>
<td>BASIC</td>
<td>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.</td>
</tr>
</tbody>
</table>

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

ADDITIONAL SUPPORT
itmsoil offer installation and monitoring services to support this system. For more information please email sales@itmsoil.com or call +44 (0) 1825 765044
## Specifications

### Vibrating Wire Transducer

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>Temperature range</th>
</tr>
</thead>
<tbody>
<tr>
<td>30mm</td>
<td>0.025% full scale</td>
<td>±0.2% full scale</td>
<td>-20 to +80°C</td>
</tr>
<tr>
<td>50mm</td>
<td>0.05% full scale</td>
<td>±0.5% full scale</td>
<td></td>
</tr>
<tr>
<td>100mm</td>
<td>0.1%</td>
<td>±1%</td>
<td></td>
</tr>
</tbody>
</table>

### Readout System

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dial Depth Gauge</td>
<td>0-50mm</td>
<td>0.01mm</td>
<td>0.05% full scale deflection</td>
</tr>
<tr>
<td>Digital Depth Gauge</td>
<td>0-100mm</td>
<td>0.01mm</td>
<td>0.03% full scale deflection</td>
</tr>
</tbody>
</table>

### Rods

<table>
<thead>
<tr>
<th>Temperature coefficients</th>
<th>Diameter</th>
<th>Lengths</th>
<th>Maximum no rods</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.5ppm/°C</td>
<td>8mm</td>
<td>1m</td>
<td>8 (manual) / 6 (remote)</td>
</tr>
<tr>
<td>3ppm/°C</td>
<td>6mm</td>
<td>2m</td>
<td></td>
</tr>
</tbody>
</table>

### Anchors

<table>
<thead>
<tr>
<th>Material</th>
<th>Diameter</th>
<th>Length</th>
<th>Maximum number of anchor points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc plated steel</td>
<td>16mm</td>
<td>540mm</td>
<td>8</td>
</tr>
<tr>
<td>Steel</td>
<td>32mm</td>
<td>450mm (single) / 820mm (double)</td>
<td></td>
</tr>
</tbody>
</table>

### Sleeves

<table>
<thead>
<tr>
<th>Material</th>
<th>Lengths</th>
<th>Inner diameter</th>
<th>Outer diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC</td>
<td>1m</td>
<td>9.6mm</td>
<td>16.7mm</td>
</tr>
<tr>
<td></td>
<td>2m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Rods and Sleeves

<table>
<thead>
<tr>
<th>Material</th>
<th>Diameter</th>
<th>Lengths</th>
<th>Inner diameter</th>
<th>Outer diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steel</td>
<td>8mm</td>
<td>1m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibreglass</td>
<td>6mm</td>
<td>1m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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; Ø19mm borehole, for use with hydraulic tubing (inch) W6-2.9.
- **E10-1.21**: Hydraulic anchor, double action; Ø19mm borehole, for use with hydraulic tubing (inch) W6-2.9.
- **E10-1.22**: Hydraulic anchor, single action; Ø100–200mm borehole, for use with hydraulic tubing (inch) W6-2.9.
- **E10-1.23**: Hydraulic anchor, double action; Ø100–200mm borehole, for use with hydraulic tubing (inch) W6-2.9.

#### Rods

- **E10-2.1**: Extensometer Stainless Steel rod; 1metre length
- **E10-2.2**: Extensometer Stainless Steel rod; 2metre length
- **E10-2.3**: Extensometer Stainless Steel rod; 3metre length
- **E10-2.4**: Extensometer Fibreglass rod; 1metre length
- **E10-2.5**: Extensometer Fibreglass rod; 2metre length
- **E10-2.6**: Extensometer Fibreglass rod; 3metre length

#### Sleeves

- **E10-2.10**: Protective sleeve; 1metre length
- **E10-2.11**: Protective sleeve; 2metre length
- **E10-2.12**: Protective sleeve; 3metre length

---

Soil Instruments Limited has an ongoing policy of design review and reserves the right to amend these specifications without notice.

E10 - Rod Extensometer - DS0614 - Rev:1.04
### Ordering Information

#### 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