

C12 IN-PLACE INCLINOMETER

Datasheet C12



Description

The In-Place Inclinometer (IPI) is used to measure lateral displacement within a borehole.

Most commonly, the IPI is used in a system where multiple IPIs are installed at varying depths. In this manner the profile of the displacement can be monitored.

The IPI itself consists of one or two (uniaxial or biaxial) MEMS tilt sensors mounted in a Stainless Steel housing.

Each sensor incorporates an on-board microprocessor which performs an automatic temperature compensation of the tilt (g) data.

The sensor itself is a small discrete device which measures in g (gravity). The sensors are powered and read by a datalogger.

'Argus' software can produce a near real time profile of displacement that is constantly updated.

Features

- **Sensor strings give a readily automated profile of vertical or horizontal displacements**
- **Accurate and precise measurements using MEMS sensors**
- **Available in uniaxial and biaxial versions**
- **Inbuilt temperature compensation**
- **Stainless Steel construction, waterproof to 2000kPa**

Benefits

- **Easy to automate using data acquisition systems and 'Argus' software**
- **Removes the need for manual monitoring**
- **Recoverable and reusable**
- **Suitable for safety critical applications**
- **Low power consumption**



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



Microelectromechanical Systems, or MEMS, is a technology that uses miniaturised mechanical and electromechanical elements that are made using the techniques of microfabrication. The physical dimensions of MEMS devices can vary from well below one micron all the way to several millimetres.

Our MEMS microsensors are small discrete devices that convert a measured mechanical signal, gravity (g) into a voltage signal.

Operation

IPIs are installed in inclinometer casing within a borehole; a sprung wheel assembly on the IPI casing engages into the keyways of the inclinometer casing to ensure alignment.

Multiple IPIs are installed at varying depths and secured using gauge rods connected to the next and previous IPI.

The final gauge rod is secured at the top of the borehole using a top support assembly.

Each IPI is connected to a datalogger which powers the sensors, initiates readings and retrieves the data.

'Argus' monitoring software can also be used to display and monitor the data.

Applications

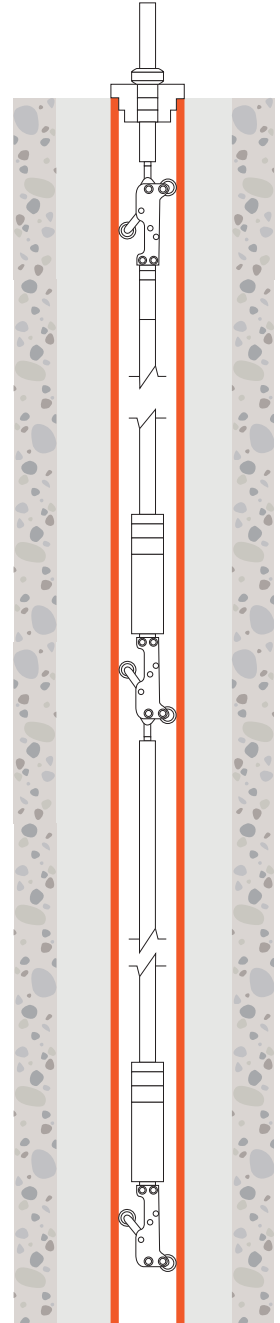
IPI systems measure lateral movement in the ground or in a structure. They are useful for determining the depth, direction, magnitude, and also rate of movement.

They can be used to ascertain the stability of retaining walls by measuring bending and rotation. They can also reveal ground movement that could affect other buildings. Inclinometer systems can also be used to detect movement in the downstream and upstream side of dams and to define shear zones in the foundations of concrete faced dams.

The measurements of recorded movement can be utilised to check that the deflections are within the design assumptions. Monitoring should be continued to establish any long-term effects after works have finished.

Typical applications include:

- Detecting slopes and landslides
- Determining shear and slip zones
- Monitoring diaphragm or sheet pile walls
- Monitoring bending in piles
- Verifying design assumptions and finite element analysis
- Long-term monitoring purposes
- Monitoring of dams
- Detecting and recording ground movement due to tunnelling operations
- Monitoring retaining walls
- Horizontal IPI systems to measure settlement and deformation of concrete slabs and tank bases



Associated products

For details on:	Catalogue code:
Dataloggers	D1
EC (Easy Connect) Inclinometer Casing	C9
Standard Inclinometer Casing	C18
Quick Drive Inclinometer Casing	C9-4
Argus Monitoring Software	D4
IPI Handheld Readout	C12-7.4

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THE TECHNICAL RATING FOR THIS PRODUCT:

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**

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

Sensors

Calibrated Range	$\pm 3^\circ$ $\pm 5^\circ$ $\pm 10^\circ$ $\pm 15^\circ$
Resolution ¹	0.008% full scale
Sensor accuracy	$\pm 0.05\%$ full scale
Operating temperature	-20 to +80°C
Repeatability	$\pm 0.01\%$ full scale
Minimum casing internal diameter	56mm
Maximum casing internal diameter	72mm
Weight (without cable)	540g
Dimensions	192mm x Ø32mm
Input voltage	10-16VDC
Signal output at full range	± 2.5 VDC differential
Current consumption	9mA (uniaxial) / 17mA (biaxial)
Ingress protection	IP68 to 200mH ₂ O (2000kPa)
Housing material	Stainless Steel

Wheel Assembly

Material	Stainless Steel
Dimensions	100mm x 85mm x 12mm
Weight	90g

Top/End Support Assembly

Gauge length	1m	2m	3m
Total length	1.9m	2.9m	3.9m
Weight	3.1kg	3.4kg	3.7kg
Range of adjustment	940mm		
Material	Stainless Steel/PVC		

Gauge Extension Tubes

Gauge length	1m	2m	3m
Length	0.76m	1.76m	2.76m
Weight	370g	766g	1130g
Diameter	19mm		
Material	Stainless Steel		

Cables

Type	Uniaxial	Biaxial
Construction	4 conductor screened polyurethane outer sheath	6 conductor screened polyurethane outer sheath
Weight	26g	33g
Cable diameter	5mm	6mm

¹Dependent on readout equipment

Ordering Information

In-Place Inclinator Sensor (uniaxial)

Includes sensor in 32mm diameter Stainless Steel housing

C12-1.6	Vertical uniaxial ± 52.3 mm/metre (± 3 arc degrees)
C12-1.1	Vertical uniaxial ± 87.2 mm/metre (± 5 arc degrees)
C12-1.2	Vertical uniaxial ± 173.6 mm/metre (± 10 arc degrees)
C12-1.7	Vertical uniaxial ± 258.8 mm/metre (± 15 arc degrees)
C12-1.5	Horizontal uniaxial ± 87.2 mm/metre (± 5 arc degrees)
C12-3.1	Wheel assembly; one per sensor, for 70mm OD casing
CA-3.1-4-IC	Instrument cable 4 core, 7/0.20; screened, priced per metre, polyurethane jacket, for use with uniaxial sensors

In-Place Inclinator Sensor (biaxial)

Includes sensor in 32mm diameter Stainless Steel housing

C12-1.8	Vertical biaxial ± 52.3 mm/metre (± 3 arc degrees)
C12-1.3	Vertical biaxial ± 87.2 mm/metre (± 5 arc degrees)
C12-1.4	Vertical biaxial ± 173.6 mm/metre (± 10 arc degrees)
C12-1.9	Vertical biaxial ± 258.8 mm/metre (± 15 arc degrees)
C12-3.1	Wheel assembly; one per sensor, for 70mm OD casing
CA-3.1-6-IC	Instrument cable, 6 core, 7/0.20; screened, priced per metre, polyurethane jacket, for use with biaxial sensors

In-Place Inclinator Extension Tubes

Includes rod end and fixings, one per sensor, minus one per hole

C12-2.1	1 metre gauge length
C12-2.2	2 metre gauge length
C12-2.3	3 metre gauge length

In-Place Inclinator Top Support and Termination Wheel Assembly

One per borehole. Includes: top of borehole support; support rod; non-articulated wheel assembly; final gauge tube & fixings. For 70mm outer diameter casing

C12-4.1	1 metre gauge tube
C12-4.2	2 metre gauge tube
C12-4.3	3 metre gauge tube
C12-7.1	Installation tool kit for standard IPI system; tool box includes: metric Allen keys, pliers, screwdriver, wire cutters, M6 nut spinner, knife, cable ties, spare nuts, hammer and bolts

In-Place Inclinator Top Support and Termination Wheel Assembly For GRP Rod Suspension

One per borehole. Includes: top of borehole support; support rod; non-articulated wheel assembly; final gauge tube & fixings. For 70mm outer diameter casing

C12-6.1	1 metre gauge tube
C12-6.2	2 metre gauge tube
C12-6.3	3 metre gauge tube
C12-7.3	Fibreglass rod for suspension; priced per metre, not recommended for use over 30 metres
C12-7.2	Installation tool kit for GRP rod IPI system; tool box as C12-7.2 including adhesive, hand drill and 2.5mm diameter drill

In-Place Inclinator Discontinuous Extension Tubes For GRP Rod Suspension

Includes rod ends and fixings, one per sensor, minus one per hole

C12-6.4	1 metre gauge length
C12-6.5	2 metre gauge length
C12-6.6	3 metre gauge length

Installation Tools

C12-7.4	Manual IPI readout
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Manual

MAN-186	In-Place Inclinator Manual
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INSTRUMENTS



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