

A close-up shows the signal cable which connects each sensor along the entire chain of inclinometer sensors forming a "digital bus"

|  |                              |
|--|------------------------------|
|  | PRODUCT CATEGORY:            |
|  | INCLINOMETERS + TILT SENSORS |

# Digital Bus MEMS In-Place Inclinometer System

Digital Bus In-Place MEMS Inclinometer Systems (IPI) are designed to measure lateral movement when remote and continuous monitoring is required.

Each IPI employs MEMS accelerometer sensors housed inside a 28.1 mm (1.125 in) diameter, water-tight, stainless steel enclosure. The sensor body is rigidly connected to a 25.4 mm (1.0 in) diameter bay rod which establishes the length of the IPI. Multiple IPIs are assembled with pivots allowing sensing of displacement over discreet, configurable intervals. Wheel assemblies centralize the pivot point and establish the azimuth of each IPI. They are available in sizes to fit 70 mm (2.75 in) or 85 mm (3.34 in) OD inclinometer casing.

The sensors are read through a connectorized signal cable chains together multiple sensors. A data logger is used to monitor the deflection of each sensor on the digital bus. If necessary, an alarm can be triggered when movement reaches a threshold rate or magnitude.



## > WHY IT IS IMPORTANT

Provides constant remote monitoring; early warning of movements is essential for protecting life and equipment.

## > APPLICATIONS

### Ideal for monitoring of:

|   |   |
|---|---|
| Stability adjacent to excavations or underground workings | Deflection of piles, piers, abutments and retaining walls |
| Dams and embankments                                      | Landslides  |

## > FEATURES

Up to 70% reduction in installation time compared to RST's previous generation of IPIs - dependent on borehole configuration

|  |   |
|--|---|
| IP68 (2 MPa), stainless steel enclosure            | Wet-mate submersible connector  |
| Precision locking & tools free bay rod connections | Reconfigurable bay lengths  |
| Industry-leading system weight                     | Industry-leading low power consumption designed for battery powered datalogging |

## > BENEFITS

|                          |  |
|--------------------------|--|
| ✓ <b>Increase safety</b> | ✓ <b>Cost effective per sensor point</b> |
| ✓ <b>High accuracy</b>   | ✓ <b>Custom options</b>                  |

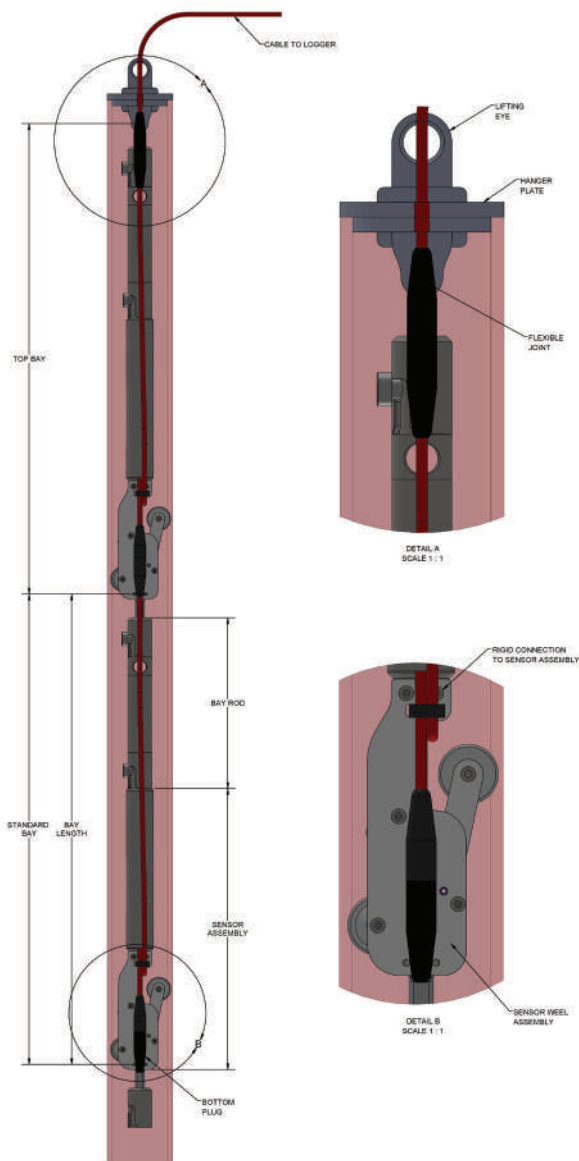


# Digital Bus MEMS In-Place Inclinator System System Configurations

|  |                              |
|--|------------------------------|
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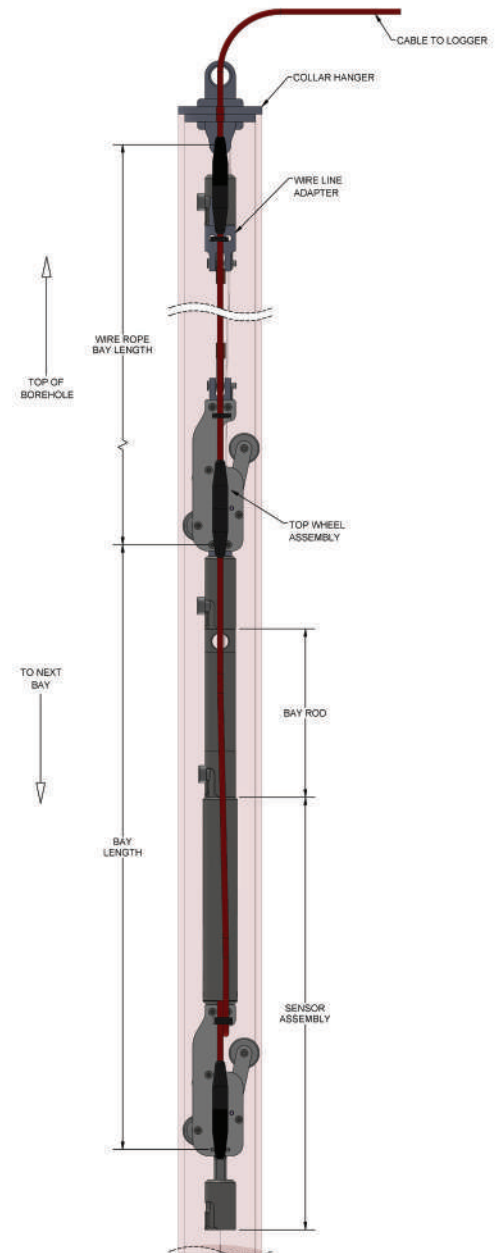
## 1. Standard

A standard configuration has sensors employed throughout the measured span of the inclinometer. The topmost bay is terminated by a collar hanger.



## 2. Wire Rope

Wire rope bays of configurable length can be inserted into the borehole configuration to omit measurement or place IPI sensors across a specific elevation.





Monitor  
with  
Confidence

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# Digital Bus MEMS In-Place Inclinometer System

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## SPECIFICATIONS + ORDERING

| SPECIFICATIONS  |  |
|---|--|
| ITEM  | SPECIFICATION  |
| <b>SENSOR</b>   |  |
| Range   | ± 30°  |
| Resolution  | 0.0002° (0.004 mm/m)   |
| Non-linearity   | ± 0.002° (0.03 mm/m)   |
| Precision   | ± 0.0013° (0.02 mm/m)<br>(99% Confidence Interval)   |
| Sensor  | MEMS (Micro-Electro-Mechanical Systems) Accelerometer  |
| Sensitivity Temperature Uncertainty                   | ± 0.01% of reading/°C  |
| Offset Temperature Uncertainty                        | ± 0.00047°C  |
| Temperature Accuracy                                  | ± 0.5 °C (0°C to 60°C)<br>± 1.0 °C (-40°C to 60°C)   |
| Temperature Resolution                                | 0.06°C   |
| <b>ELECTRICAL</b>                                     |  |
| Supply Voltage  | 5 to 15V DC  |
| Operating Current                                     | 490 uA (Reading Average, per sensor)   |
| Standby Current                                       | <20uA (per sensor)   |
| Signal Output   | RS485 Digital Bus (MODBUS RTU Protocol)  |
| Operating Temp.                                       | -40 to 60°C (-40 to 140°F)   |
| <b>MECHANICAL</b>                                     |  |
| Ingress Protection                                    | IP68 (2 MPa)   |
| Gauge Length  | 0.5 to 3 m   |
| Sensor Diameter                                       | 28.6 mm (1.125 in)   |
| Bay Rod Diameter                                      | 25.4 mm (1.0 in)   |
| Wheel Assembly  | 70 mm (2.75 in)<br>85 mm (3.34 in)   |
| System Maximum Weight                                 | 180 kgf  |
| Sensor & Bay Rod Assembly Weight (dry, submerged H2O) | 0.5m: 1.25, 1.00 kgf<br>1.0m: 1.63, 1.12 kgf<br>1.5m: 2.00, 1.24 kgf<br>2.0m: 2.37, 1.36 kgf<br>3.0m: 3.11, 1.60 kgf |

| ORDERING: GENERAL INFO REQUIRED |   |
|---------------------------------|---|
| Part number                     | Bay length                                  |
| Number of boreholes             | Wheel assembly size<br>(70 or 85 mm casing) |
| Number of sensors per borehole  | Optional wire rope bays & cables            |

| ORDERING: BAY RODS             |        |
|--------------------------------|--------|
| ITEM                           | PART # |
| 0.5 m Bay Rod                  | IC8011 |
| 1.0 m Bay Rod                  | IC8012 |
| 1.5 m Bay Rod                  | IC8013 |
| 2.0 m Bay Rod                  | IC8014 |
| 3.0 m Bay Rod Bay Rod          | IC8015 |
| Custom Metric Length Bay Rod   | IC8010 |
| 3.0 ft Bay Rod                 | IC8021 |
| 5.0 ft Bay Rod                 | IC8022 |
| 10.0 ft Bay Rod                | IC8023 |
| Custom Imperial Length Bay Rod | IC8020 |

| ORDERING: SENSORS                           |                 |
|---|-----------------|
| ITEM  | PART #          |
| Vertical 70 mm IPI                          | IPI27050-U-70mm |
| Vertical 85 mm IPI                          | IPI27050-U-85mm |
| Horizontal 70 mm IPI                        | IPI27050-D-70mm |
| Horizontal 85 mm IPI                        | IPI27050-D-85mm |
| Contact RST if a custom sensor is required. |                 |

| ORDERING: BOREHOLE ACCESSORY KITS   |        |
|---|--------|
| ITEM  | PART # |
| 70 mm Borehole Accessory Kit<br>(70 mm Collar Hanger, Bottom Plug, Safety Cable Attachment Kit, Extra Screws) | IC8000 |
| 85 mm Borehole Accessory Kit<br>(85 mm Collar Hanger, Bottom Plug, Safety Cable Attachment Kit, Extra Screws) | IC8001 |

| ORDERING: COLLAR HANGERS |        |
|--------------------------|--------|
| ITEM                     | PART # |
| 70 mm Hanger             | IC8030 |
| 85 mm Hanger             | IC8031 |

| ORDERING: WIRE ROPE AND RELATED WIRE ROPE PRODUCTS         |        |
|--|--------|
| ITEM   | PART # |
| Wire Rope (sold in meters)                                 | IC8065 |
| 70 mm Wire Rope Accessory Kit<br>(Wheel Assembly, Adapter) | IC8070 |
| 85 mm Wire Rope Accessory Kit<br>(Wheel Assembly, Adapter) | IC8071 |
| 70 mm Wire Rope Wheel Assembly                             | IC8075 |
| 85 mm Wire Rope Wheel Assembly                             | IC8076 |
| Male Adapter for Wire Rope                                 | IC8080 |

| ORDERING: SAFETY LINE           |        |
|---------------------------------|--------|
| ITEM                            | PART # |
| Safety Line<br>(sold in meters) | IC8040 |
| Safety Line Attachment Kit      | IC8045 |

| ORDERING: CABLES AND PLUGS                  |        |
|---|--------|
| ITEM  | PART # |
| 5 m Top Cable                               | IC8051 |
| 10 m Top Cable                              | IC8052 |
| 20 m Top Cable                              | IC8053 |
| Custom Length Top Cable                     | IC8050 |
| Bottom Cable Male Plug                      | IC8060 |
| 5 m Wire Rope Communication Cable Extension | IC8085 |

| OPTIONS >> CONTACT RST FOR DETAILS                 |
|--|
| Imperial lengths available upon request            |
| Custom casing diameter wheel assemblies            |
| Custom Bay Lengths Available                       |
| Ultra-Rugged Field PC2 (see separate brochure)     |
| DT2485: DT-BUS Data Logger (see separate brochure) |
| FlexDAQ Data Logger System (see separate brochure) |

