



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

WORKS WITH **flexDAQ** DATA LOGGERS

**READY TO RUN**  
pre-assembled  
pre-wired  
pre-tested  
pre-programmed



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



# Digital Bus In-place MEMS Inclinometer System

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

Each IPI employs MEMS accelerometer sensors housed inside a 31.75 mm (1.25 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.) O.D. inclinometer casing.

The sensors are read through a connectorized signal cable designed to chain together multiple sensors. A datalogger 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, or retaining walls. |
| Dams and embankments.                                      | Landslides.                                                |

## > FEATURES

|                                         |                                    |
|-----------------------------------------|------------------------------------|
| IP68 (2MPa), stainless steel enclosure. | Expandable digital bus.            |
| High precision, centralizing wheels.    | Easy adaptability to data logging. |
| Individual sensor monitoring.           | Optional alarm.                    |

## > BENEFITS

|                                |                                          |
|--------------------------------|------------------------------------------|
| ✓ <b>Increase Safety</b>       | ✓ <b>Cost effective per sensor point</b> |
| ✓ <b>Increase Productivity</b> | ✓ <b>Custom Options</b>                  |
| ✓ <b>High Reliability</b>      | ✓ <b>High Accuracy</b>                   |



The optional HOSS (Heavy Over-hole Suspension System) can be purchased to reduce the exertion required to lower & lift instruments into boreholes. Lowering sensors into inclinometer casing on a bottom cable simplifies installation. View brochure at [rstinstruments.com](http://rstinstruments.com) or contact RST for more info.



VIEW IN ACTION:  
<https://youtu.be/E-Y3pQ6VwfQ>

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## System Setup: 4 Types

### 1 > TO COLLAR

A standard setup, this configuration has the entire sensor assembly suspended directly to the collar hanger.

### 2 > RIGID ROD

A rigid rod is connected to the bottom of the collar and then a bay rod is connected to the bottom of the rigid rod. The sensor assembly is suspended from the bottom of the bay rod.

### 3 > WIRE ROPE

In this configuration, a wire rope bay leads off from the bottom of the collar hanger. The sensor assembly is suspended from the bottom of the wire rope.

### 4 > VARIATIONS

Systems can also consist of variations between bay length/sensor connections by using any combinations of wire rope and direct 'sensor-to-sensor' connections.

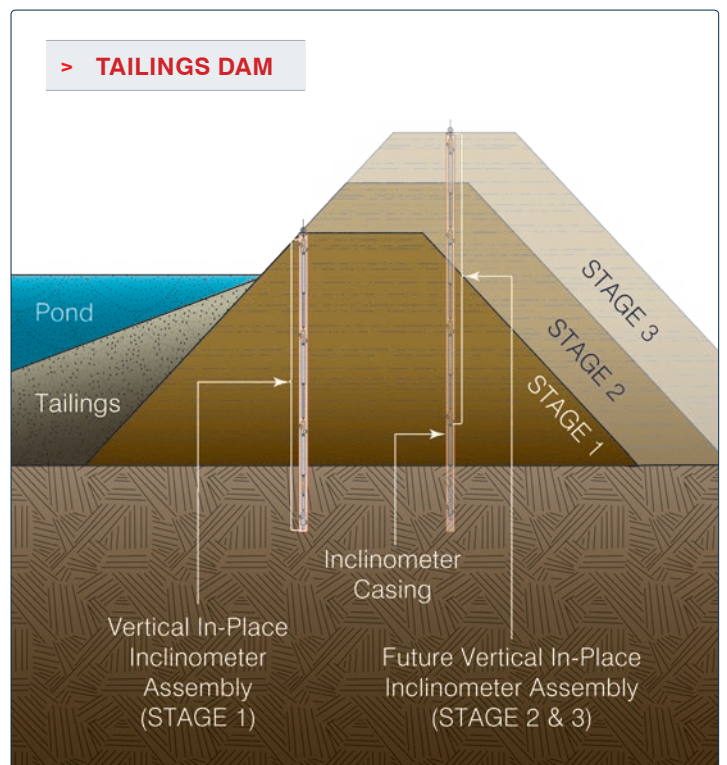
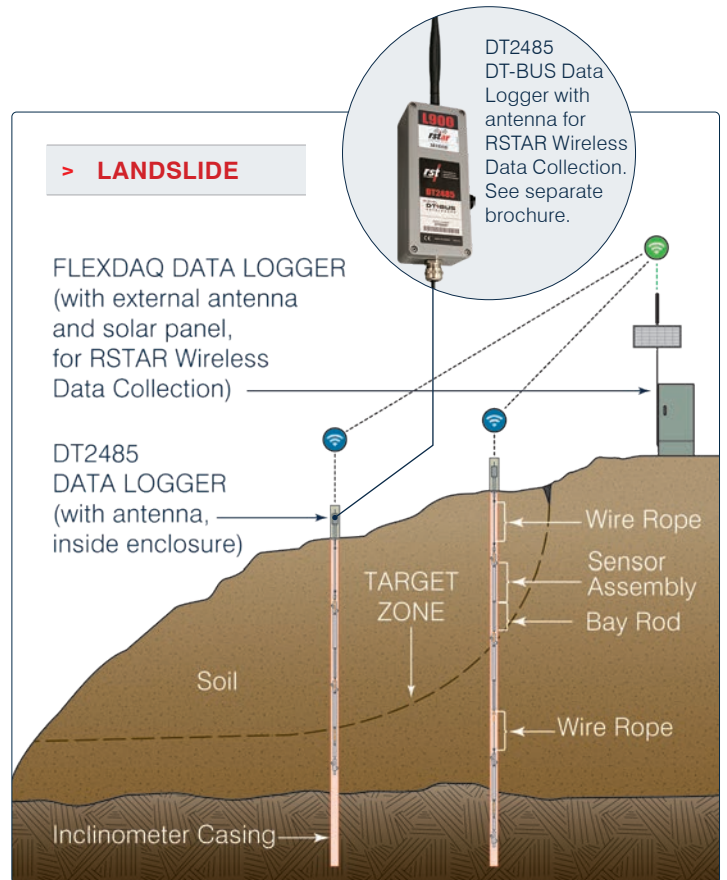
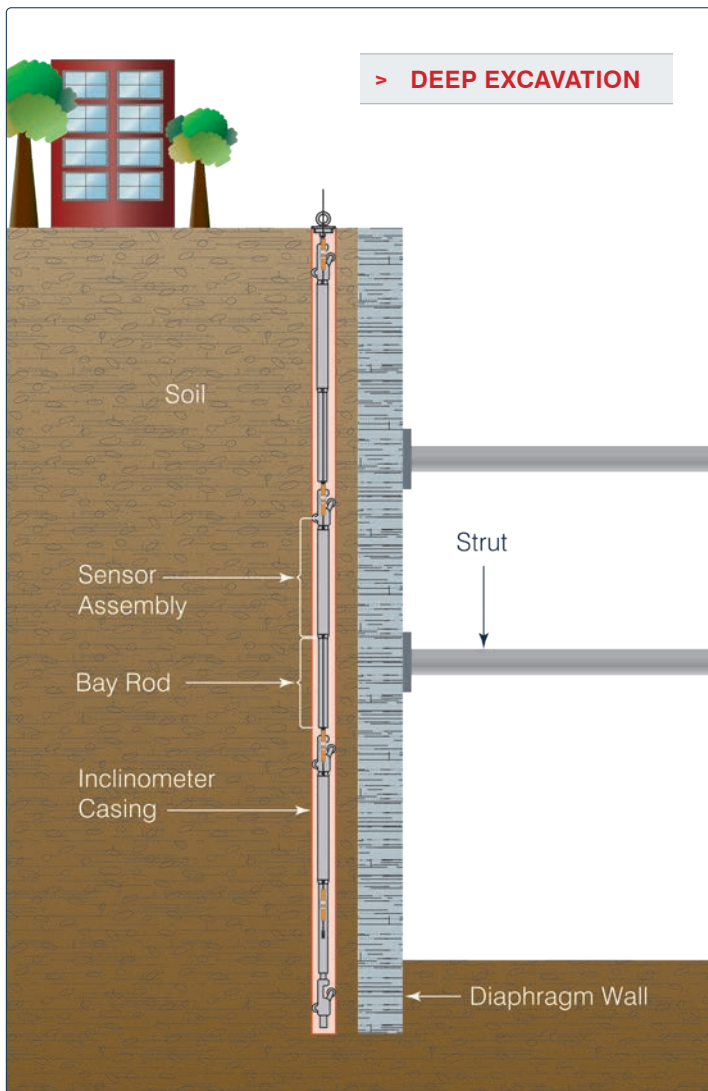
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## Installation Scenarios

The 4 main system setup types (see left page) can all be installed interchangeably across all applications where lateral movement, or deflection of structures can occur. The selection of the system setup type depends on site conditions & engineering requirements. As shown in the installation scenarios, the Vertical In-Place Inclinometer System is ideal for long term installation in trenches, landslide areas, dams and embankments.

Automated data collection methods can be made with the use of the RST DT2485 DT-BUS Data Logger or a FlexDAQ Data Logger System. For incorporating wireless data collection, the DT2485 is RSTAR and DT Link compatible. Manual data collection is available using the 'Ultra-Rugged Field PC2' - see separate brochure at rstinstruments.com.





Monitor  
with  
Confidence

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# Digital Bus In-place MEMS Inclinometer System

|  |                              |
|--|------------------------------|
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|  | INCLINOMETERS + TILT SENSORS |

## SPECIFICATIONS + ORDERING

| SPECIFICATIONS     |                                                                  |
|--------------------|------------------------------------------------------------------|
| <b>ELECTRICAL</b>  |                                                                  |
| <b>ITEM</b>        | <b>SPECIFICATION</b>                                             |
| Range              | ±15°                                                             |
| Resolution         | ±1 arc sec. (±0.0003°) (0.004 mm/m)                              |
| Non-linearity      | ±0.0125% F.S. (±0.002°) (0.03 mm/m)                              |
| Repeatability      | ±0.0125% F.S. (±0.002°) (0.03 mm/m)                              |
| Sensor             | MEMS (Micro-Electro-Mechanical Systems) Accelerometer - Triaxial |
| Sensor Offset      | +/- 0.002 arc deg./deg. C                                        |
| Sensor Sensitivity | +/- 0.013 % of reading/deg. C                                    |
| Supply Voltage     | 8 - 15V DC                                                       |
| Operating Temp.    | -40 to 60°C (-40 to 140°F)                                       |
| Ingress Protection | IP68 to 200m H <sub>2</sub> O (2 MPa)                            |
| <b>MECHANICAL</b>  |                                                                  |
| Gauge Length       | 0.5 - 3 meters                                                   |
| Housing Diameter   | 31.75 mm (1.25 in.) (sensor)                                     |
| Wheel Assembly     | 70 mm (2.75 in.)<br>85 mm (3.34 in.)                             |
| Bay Rod Diameter   | 25.4 mm (1.0 in.)                                                |

| ORDERING: SENSORS                                          |               |
|------------------------------------------------------------|---------------|
| <b>DIGITAL BUS CABLE SYSTEM</b>                            | <b>PART #</b> |
| MEMS IPI bus sensor assembly: Biaxial for 70 mm casing     | IC7565B       |
| MEMS IPI bus sensor assembly: Biaxial for 85 mm casing     | IC7575B       |
| MEMS IPI bus sensor assembly: Uniaxial for 70 mm casing    | IC7560B       |
| MEMS IPI bus sensor assembly: Uniaxial for 85 mm casing    | IC7570B       |
| <b>DIGITAL WIRE ROPE SYSTEM WITH BOTTOM WHEEL ASSEMBLY</b> | <b>PART #</b> |
| MEMS IPI assembly: Biaxial 70 mm casing                    | IC7525B       |
| MEMS IPI assembly: Biaxial 85 mm casing                    | IC7555B       |
| MEMS IPI assembly: Uniaxial 70 mm casing                   | IC7520B       |
| MEMS IPI assembly: Uniaxial 85 mm casing                   | IC7550B       |

| ORDERING: BAY RODS                               |               |
|--------------------------------------------------|---------------|
| <b>DIGITAL BUS, OR DIGITAL WIRE ROPE SYSTEMS</b> | <b>PART #</b> |
| Bay rod for 0.5 m gauge length                   | IC7700        |
| Bay rod for 1 m gauge length                     | IC7701        |
| Bay rod for 1.5 m gauge length                   | IC7702        |
| Bay rod for 2 m gauge length                     | IC7703        |
| Bay rod for 2.5 m gauge length                   | IC7704        |
| Bay rod for 3 m gauge length                     | IC7705        |

| 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  | Length of surface signal cable              |
| Location of sensors in borehole | Optional wire rope bays                     |

| ORDERING: CABLES                                                      |               |
|-----------------------------------------------------------------------|---------------|
| <b>DIGITAL BUS, AND DIGITAL WIRE ROPE SYSTEM</b>                      | <b>PART #</b> |
| 4 conductor, 22 gauge polyurethane jacketed cable (digital bus)       | EL380004      |
| <b>SUSPENSION CABLE<br/>- WIRE ROPE SYSTEM OR COLLAR TO FIRST BAY</b> | <b>PART #</b> |
| Stainless steel suspension cable 3/32"                                | IC7300        |

| OPTIONS >> CONTACT RST FOR DETAILS                 |
|----------------------------------------------------|
| Imperial lengths available upon request            |
| Submersible cable connector for bus options        |
| Ultra-Rugged Field PC2 (see separate brochure)     |
| DT2485: DT-BUS Data Logger (see separate brochure) |
| FlexDAQ Data Logger System (see separate brochure) |

| ORDERING: COLLAR HANGERS                                 |               |
|----------------------------------------------------------|---------------|
| <b>DIGITAL BUS SYSTEM</b>                                | <b>PART #</b> |
| Collar hanger w/1 bottom wheel assembly for 70 mm casing | IC7070        |
| Collar hanger w/1 bottom wheel assembly for 85 mm casing | IC7085        |
| <b>DIGITAL WIRE ROPE SYSTEM</b>                          | <b>PART #</b> |
| Collar hanger for 70 mm casing                           | IC7070R       |
| Collar hanger for 85 mm casing                           | IC7085R       |

