



LEA\_IT\_INC2001001



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# MEMS Inplace Inclinometer

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[www.pizzi-instruments.it](http://www.pizzi-instruments.it)  
Instruments and Systems for Geotechnical and Structural Monitoring

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## MEMS Inplace Inclinometer



### Description

The IPI inclinometers we offer are composed of an integrated system, where power supply electronics, transmission signal electronics and MEMS sensors, are housed together in one probe casing. The instrument is fully waterproof and is suitable for use in conventional inclinometer columns. It is normally used with an inclinometer tube in drilled holes for the monitoring of horizontal movement in soil,

landslides and deformations of structure.

Generally this type of sensor is used to form chains inserted into the same tube, thereby providing automatic measurement of the deformation of an inclinometer column (as an alternative to systems with manual probe inclinometer).

## Applications

The IPI system is used to monitor movements in soil or movement of structures.

It can be used inside inclinometer tubes for many applications:

- **Landslides**
- **Identification of shear zones**
- **Diaphragms**
- **Piles**
- **Dams**
- **Tunnels**
- **Bridges**
- **Road and railway embankments**
- **Various**

The IPI system has also been designed for monitoring in horizontal applications.

## Features and benefits

- **Accuracy of measurements**
- **Precision of manufacture**
- **Versatility**
- **Low cost**
- **Built-in electronics**
- **Removable instrument**

The IPI system has also been designed for monitoring in horizontal applications and for vertical applications (or inclined).

## Measurement principle —

The IPI we offer is made of a cylindrical stainless steel body, complete with tilting wheels for maintaining orientation in the guide tubes where it is generally installed.

Accuracy of calibration ensures low dependence on temperature, high resolution and low influence from disturbances. The control system is generally composed of multiple IPI sensors, connected to each other via a single cable for the version with output signal, or with independent cables for the version with analogue output, inserted into an inclinometer column which forms the reference element and guide for the entire system.

Thanks to the pairs of guide wheels on the body of

each instrument, the chain is lowered into the column, bringing the various sensors in the chain to the pre-established level.

The inclinometer column follows the ground's movements, consequently causing a change in inclination of the individual IPI sensors which automatically provide data revealing the deformation of the column.

The first instrument in the chain is connected to an acquisition unit (our CUM3000), where all automatically acquired data is sent to processing and analysis software, which allows, amongst other things, alarm messages to be sent when control parameters are exceeded.

## Characteristics

### Sensor

|      |                      |
|------|----------------------|
| Type | Monoaxial or biaxial |
|------|----------------------|

### Digitiser

|               |                                   |
|---------------|-----------------------------------|
| Type          | 2-Channels 24-Bit Sigma-Delta ADC |
| Sample rating | 100 SPS per channel               |

### General Specifications

|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Range                                     | $\pm 15^\circ$ , (upon request)     |
| Linearity                                 | $\pm 0,1\%$ f.s.                    |
| Resolution                                | 0,001°                              |
| Thermal drift                             | 0.01%/°C                            |
| Thermal Drift Offset -25...85°C (typical) | $\pm 0,002$ °/°C                    |
| Thermal Drift Offset -40...125°C (max)    | -2,5 ..... +1                       |
| Long term stability                       | <0,004°                             |
| Output                                    | Angle in 0,001° Temperature in 0,1° |

### Mechanical

|                     |                            |
|---------------------|----------------------------|
| Material            | Acciaio inox               |
| Lenght              | Da 0,5m a 1m               |
| Diameter            | Pipe $\varnothing = 31$ mm |
| Protection Degree   | IP 68 a 200m di H2O        |
| Weight              | Circa 500 g                |
| Working temperature | - 40 to 85 °C              |

### Power supply

|              |                            |
|--------------|----------------------------|
| Power Supply | 10 to 25 VDC               |
| Absorption   | 15mA @15VDC                |
| Connector    | On board                   |
| OVP          | All contacts are protected |

### Communication

|                        |                                                        |
|------------------------|--------------------------------------------------------|
| Serial Port            | RS-485 port                                            |
| Sampling               | 2400, 4800, 9600, 19200, 38400, 57600                  |
| Protocol Communication | MODBUS RTU                                             |
| Security Protocol      | Checksum                                               |
| Sensor Connection      | Up to 128 sensors with a single cable type 2x2x0.5 mm2 |

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The product information may be subject to variations at any time.  
Please carefully check the release and contact Pizzi Instruments for further details.

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