

Ackcio GeoArray

Reliable and Flexible 3D Displacement Monitoring Sensor



PRODUCT OVERVIEW

Ackcio GeoArray is a continuous in-place displacement array designed for 3D deformation monitoring of slopes, embankments, retaining walls, dams, and tunnels.

It replaces manual inclinometers and traditional In-Place Inclinometers by providing automated, high-accuracy displacement data in real time, with no routine maintenance or recalibration required.

The sensor consists of a continuous chain of stainless-steel segments, each containing a high-precision triaxial MEMS tilt sensor and electronics, connected by flexible joints. This robust, sealed design allows the GeoArray to bend naturally within a borehole and withstand harsh field conditions for many years, offering long-term stability and reliability.

Each segment integrates its own MEMS sensor and acquisition circuitry, performing onboard computation and outputting direct X/Y/Z displacement data through the Ackcio Digital Node, without the need for any external PC.

Optional modules enable the simultaneous measurement of groundwater level and layered settlement, providing a comprehensive solution for subsurface deformation and hydro-geotechnical monitoring.

Combined with Ackcio's wireless Beam Mesh Network, installation and deployment are simple and fast, reducing setup time, eliminating manual readings, and ensuring hassle-free, continuous monitoring.

Displacement
Sensor →

← Flexible
Joints

← Groundwater
Sensor

**Sample illustration of the product*

KEY FEATURES

- **High precision:** $\pm 0.005^\circ$ angular accuracy; 0.01 mm displacement resolution
- **Internal processing:** Built-in acquisition & calculation; direct coordinate output (X/Y/Z)
- **Ultra-low power:** ≤ 2.5 mA @ 12 V per segment
- **Wide voltage:** 5 – 30 V DC
- **High durability:** IP68 rated, 2 MPa standard / 4.5 MPa high-pressure version
- **Temperature compensated:** -40°C to $+85^\circ\text{C}$ operation
- **RS-485 interface** for seamless integration with Ackcio Digital Node
- **Edge processing:** Outputs ready-to-use displacement data via wireless Ackcio Beam Mesh.

APPLICATIONS

- Slope and landslide monitoring
- Excavation and retaining wall movement
- Dam and embankment stability
- Tunnel and pipeline convergence
- Settlement and foundation movement
- Rail track settlement monitoring

TECHNICAL SPECIFICATIONS

SENSOR

Parameter	Specification
Sensor Type	MEMS Tilt Sensor (tri-axis)

Parameter	Specification
Measurement Axes	X, Y, Z (3D displacement)
Measurement Interval	0.5 m or 1 m
Max Measurement Length	100 m (0.5m / segment) 200 m (1.0m / segment)
Angle Range	360°
Resolution	0.001°
Accuracy	$\pm 0.005^\circ$
Displacement Resolution	0.01 mm
Stability	± 1.0 mm @ 50 m
Temperature Drift	< 1 mm @ 50 m (-20°C ~ $+55^\circ\text{C}$)
Long-term Calibration Stability	0.05° drift over 10 years

⚡ POWER

Parameter	Specification
Supply Voltage	DC 5 – 30 V
Average Current	≤ 2.5 mA @ 12 V per segment
Peak Current	4 mA @ 12 V per segment
Power Consumption Formula	$15\text{ mA} + (N \times 2.5\text{ mA})$ @ 12 V
Segment Limit (Battery Power)	≤ 70 segments
Segment Limit (External Power)	> 70 segments

**COMMUNICATION & DATA
PROCESSING**

Parameter	Specification
Interface	RS-485 – Ackcio Digital Node
Connectivity	Ackcio Digital Node → Ackcio Gateway (4G/ Wifi)
Output Data	Ready X/Y/Z displacement (mm)
Processing Type	On-node (edge processing)
External PC	None

 MECHANICAL

Parameter	Specification
Material	304 / 316 Stainless Steel
Diameter	Max Ø22 mm, Min Ø18 mm
Recommended Borehole Casing	Ø70 mm (standard inclinometer casing)
Weight	0.6 kg per segment
Segment Connection	Flexible joint with waterproof sealing

 ENVIRONMENTAL

Parameter	Specification
Operating Temperature	–40 °C to +85 °C
Protection Rating	IP68
Water Pressure Resistance	2 MPa (standard) / 4.5 MPa (high-pressure version)

ORDERING INFORMATION

Model	Specification
BEAM-GA-V	GeoArray for vertical installation, available in 0.5 m and 1.0 m segment options.
BEAM-GA	GeoArray for horizontal or inclined installation, available in 0.5 m and 1.0 m segment options.
BEAM-GA-A	Accessories kit for GeoArray vertical installation (includes borehole cap, extension cable, and mounting accessories).
BEAM-GA-GW	Groundwater level and temperature sensor
BEAM-GA-LS	Layered settlement (extensometer); installation depth within the GeoArray must be specified when ordering

PRODUCT PACKAGING

- Packaging is available in carton or wooden crate, depending on sensor length.
- Each GeoArray segment weighs approximately 1 kg.
- Carton packaging is used for arrays up to 60 segments.
 - Typical carton sizes: 105 × 22 × 22 cm or 105 × 30 × 22 cm.
- Wooden crate packaging is used for arrays above 60 segments.
 - Standard wooden crate size: 120 cm × W × 120 cm, where width (W) is customized according to sensor length.

PACKAGING STYLE EXAMPLES

- Carton Packaging: Used for shorter arrays (≤ 60 segments).
- Wooden Crate Packaging: Used for longer arrays (> 60 segments).

