

## Focus-Information

▼  
▲ **Geotechnology** ▼  
▲ Hydrogeology ▼  
▲ Monitoring ▼

Geotechnology >> Inclination / deviation measurement

## CLINO-Chain: Inclinometer Chain

**Inclinometer chains are used to monitor displacements in the structure or along the axis of a borehole**

### Applications

The Clino-Chain is often used to measure displacements in tunnels and excavation pits, especially in urban areas.

Additionally, it is applied to monitor and localise vertical displacements beneath embankments and along instable slopes or earth dams.



### Services of Solexperts

- Advice in implementing the measuring concepts
- Configuration, sale and installation of the Modular Reverse-Head Extensometer
- Read-out of the measured data and preparation of report
- Display of the measured results in the WebDAVIS data visualization system



### Features of the measuring system

- Easy to install chain of inclinometers
- Innovative joints (static-determinate bearing for each probe)
- Only one data cable
- Automatic measurements of relative inclination
- Vertical measurements, uni- or biaxial
- Horizontal measurements, uniaxial
- Data directly in mm/m
- Compatible with Solexperts GeoMonitor, Solexperts Data Logger and WebDavis
- Easily retrievable

## Measurement procedure

The CLINO-Chain measures transversal displacements at multiple points along a borehole axis.

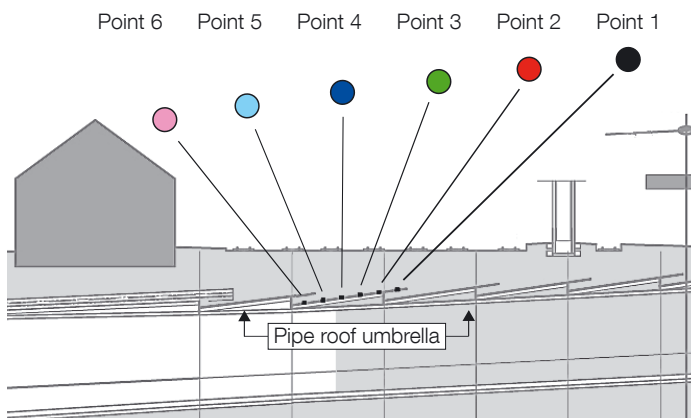
The instrument is composed of sequentially mounted probes that are of variable length (min. 50 cm). These probes are connected together by swivel heads with spring-loaded wheels that guide the probe in the center of the grooved casing and fix the chain at the desired position.

Each probe includes a high-precision and highly-stable uni- or biaxial inclinometer sensor.



## Simple and flexible system

- The CLINO-Chain is completely retrievable and reusable
- The installation depth of the chain in the borehole is easily adjusted on-site
- The joint between the single elements is the support point, so the inclination is precisely measured
- Only one cable is used for the entire CLINO-Chain
- The measurements are directly reported in mm/m and read by a PC



## Measurement casings

The CLINO-Chain is installed in a casing with guiding grooves (inclinometer casing). The casing is generally installed perpendicular to the expected displacement direction. Several inclinometer casings are available to meet the project requirements:

- Standard Solexperts Inclinometer casing constructed of PVC, outer diameter 70 mm, inner diameter 58 mm, self-centring couplings every 3.05 m
- If large displacements are expected in the direction of the casing, the casing is equipped with telescope couplings

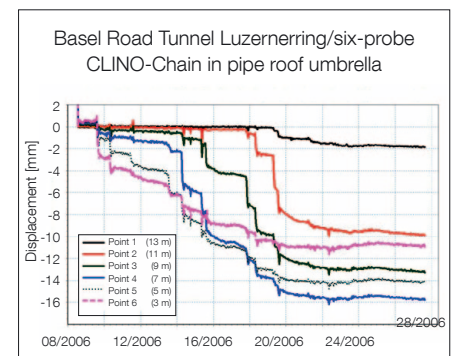


## Data acquisition and visualisation

(see separate sheet)

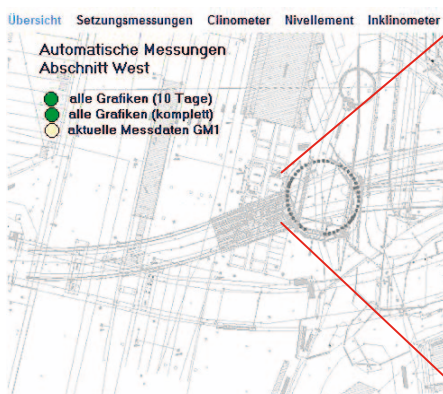
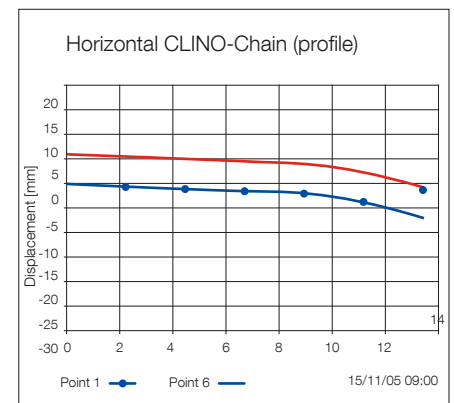
A number of possibilities to monitor and present the data are available:

- Manual readout with a digital readout device
- Autonomous Data Logger (Solexperts Data Logger), storage of the measurements and periodical readout on a PC with the Solexperts SDL-Tool Software
- Real-time measurement with Solexperts GeoMonitor II and WebGeoMonitor, allowing one or more CLINO-Chains and additional sensors to be connected
- Visualisation of all measurements on the Internet by Solexperts WebDAVIS



### Example: Basel, Tunnel Luzernerring

The Luzernerring tunnel passes beneath the existing St. Johann railway station, the SBB railway tracks and the Luzernerring Bridge. The tunnel was advanced using the pipe roofing system. The vertical displacements were monitored by CLINO-Chains installed in the pipe roof casings. The measured data were displayed graphically by WebDavis and were available on a password protected Internet site at anytime and from anywhere.



## The customised CLINO-Chain

Custom length CLINO-Chains are available to meet your project needs:

**Data acquisition** (see page 3)

### Data cable

With connecting plug for manual or automatic data acquisition.

### Fibre glass rod

Securing the CLINO-chain at the desired position in the casing.

### Measurement Casing

Elements of 3 m length.

### Probe «Top» + Probe «n»

Custom length (minimum 0.5 m).

### Probe «Bottom»

Variable length (minimum 0.5 m).

Rubber protection for installation at the casing bottom.

### Inclinometer probe

Uni- or biaxial, range  $\pm 5^\circ$ ,  $\pm 10^\circ$  or  $\pm 30^\circ$ .

### Solexperts data acquisition - visualisation software

- GeoMonitor II
- Solexperts Data Logger SDL
- WebDavis

## Technical data

• Measuring range (F.S.):	$\pm 10^\circ$ , $\pm 30^\circ$
• Resolution:	$\pm 0.002$ mm/m
• Accuracy (standard):	$\pm 0.03\%$ mm/m
• Temperature coefficient:	0.008% F.S. /°C (-40° to +85°C)
• Element length:	0.5 m minimum
• Diameter of the extension casing:	32 mm
• Outer diameter of the inclinometer casing:	70 mm / 84 mm
• Water resistance:	12 bar
• Power supply:	via Clino-Chain Interface

Subject to technical changes

### Solexperts AG

Mettlenbachstrasse 25  
P.O. Box 81  
8617 Mönchaltorf  
Switzerland

Tel +41 (0) 44 806 29 29  
Fax +41 (0) 44 806 29 30

info@solexperts.com  
www.solexperts.com

