

## Focus-Information

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Geotechnics >> Deformation- /Elasticity-Measurement >> Dilatometer

## Dilatometer measurements

### In-situ determination of deformation and elasticity properties of rock formations

#### Applications

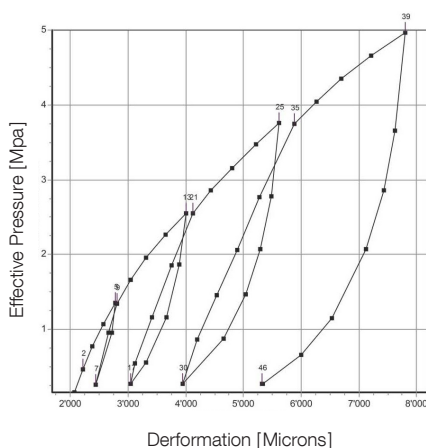
Dilatometer tests provide the deformation and elastic moduli of bedrock and unconsolidated rock in the borehole under in-situ conditions. The rock properties which are determined from dilatometer tests are important parameters for the planning and dimensioning of tunnels, caverns and other underground structures. The deformation behaviour of the rocks is measured by expanding the borehole through multiple load-unload cycles.

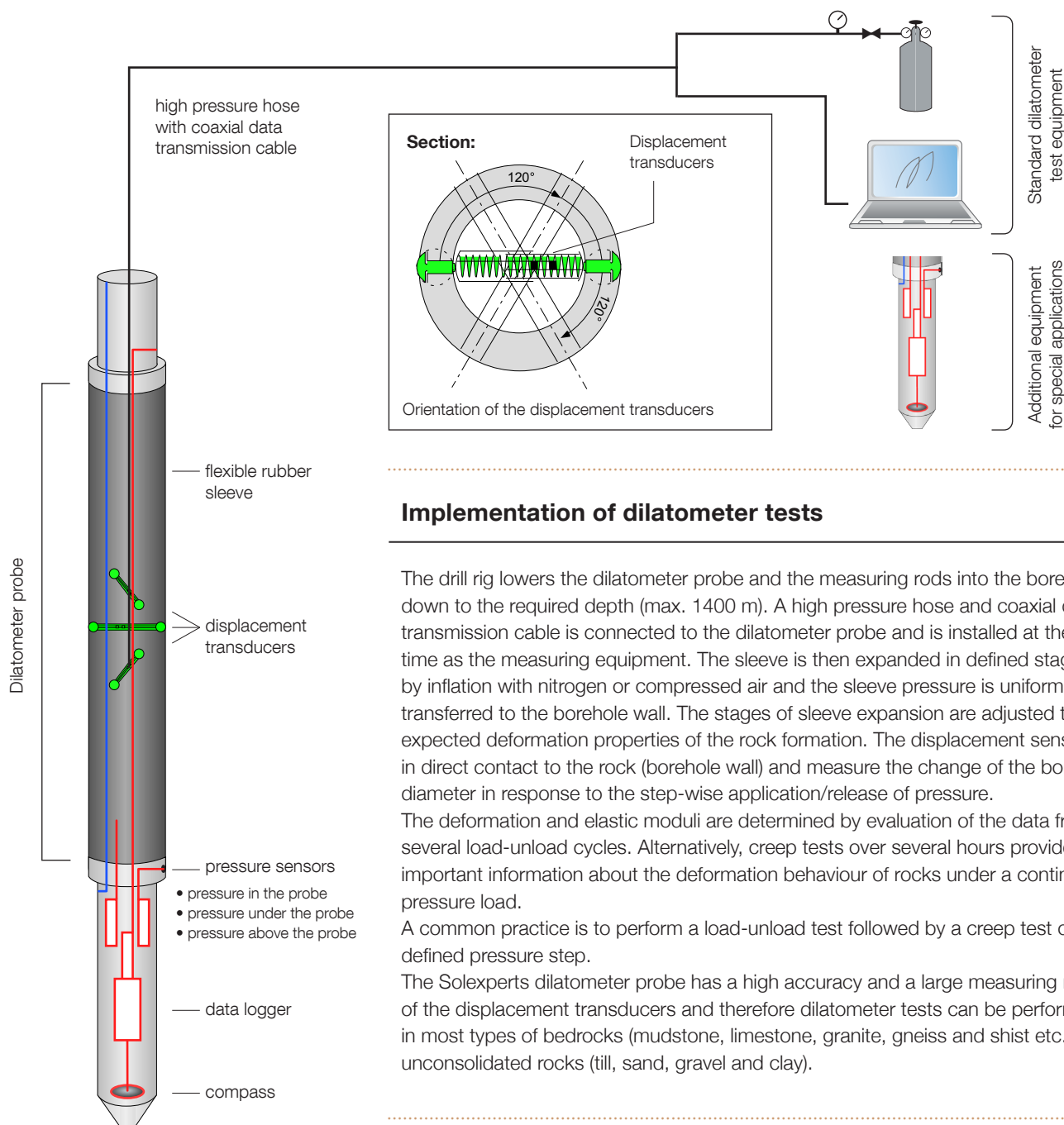
Solexperts can resort to extensive experience in the implementation and evaluation of dilatometer tests.



#### Specifications of the Solexperts dilatometer systems

- Measurements in depths of up to 1400 m with borehole diameters of 96 mm, 101 mm, 122 mm, 146 mm and **new 76 mm** and maximum pressures of up to 200 bar
- Direct contact of the displacement transducers and the rock formation (borehole wall) provides unbiased data
- By using flexible rubber sleeves the pressure is uniformly applied to the borehole wall, therefore the moduli can be determined without any correction factors
- The probe has an integrated compass with which the influence of fractures and/or other anisotropies of the rock formation can be determined
- On-line data acquisition and real-time visualisation optimises the control of the dilatometer test
- Sleeve pressurisation with nitrogen or compressed air avoids negative impacts on the environment in case of leaking test equipment





## Implementation of dilatometer tests

The drill rig lowers the dilatometer probe and the measuring rods into the borehole down to the required depth (max. 1400 m). A high pressure hose and coaxial data transmission cable is connected to the dilatometer probe and is installed at the same time as the measuring equipment. The sleeve is then expanded in defined stages by inflation with nitrogen or compressed air and the sleeve pressure is uniformly transferred to the borehole wall. The stages of sleeve expansion are adjusted to the expected deformation properties of the rock formation. The displacement sensors are in direct contact to the rock (borehole wall) and measure the change of the borehole diameter in response to the step-wise application/release of pressure.

The deformation and elastic moduli are determined by evaluation of the data from several load-unload cycles. Alternatively, creep tests over several hours provide important information about the deformation behaviour of rocks under a continuous pressure load.

A common practice is to perform a load-unload test followed by a creep test on a defined pressure step.

The Solexperts dilatometer probe has a high accuracy and a large measuring range of the displacement transducers and therefore dilatometer tests can be performed in most types of bedrocks (mudstone, limestone, granite, gneiss and shist etc.) and unconsolidated rocks (till, sand, gravel and clay).

## Specifications

### Dilatometer probe

- Length (rubber sleeve): 800<sup>1)</sup>/1000 mm
- Diameter:
  - NEW >>> - 72 mm (for boreholes with Ø 76 mm)**
  - 92 mm (for boreholes with Ø 96 mm)
  - 96 mm (for boreholes with Ø 101 mm)
  - 118 mm (for boreholes with Ø 122 mm)
  - 142 mm (for boreholes with Ø 146 mm)
- Maximum depth: 1400 m
- Pressure range: from 5 to 200 bar
- Rubber sleeve: radially expandable, adjusts uniformly to borehole wall without the development of point loads

### Displacement transducers:

- 3 sensors arranged at 120° to each other with 2 measuring points each
- Sensitivity: 0.001 mm
- Measuring range: 20 / 27<sup>1)</sup> mm
- contact between displacement transducers and borehole wall via steel pins with ball-shaped tips through the rubber sleeve and flush with the outside of the rubber sleeve

### Data aquisition system:

- automatic on-line visualisation of the pressure/ deformation curves («Dilato» software)
- the measuring interval can be selected between 1 second and several hours
- evaluation and representation of the test results with the «Dilato» software

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<sup>1)</sup> Dilatometer probe 72 mm