

Dilatometer Tests

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HIGHLIGHTS

- Up to 200 bar pressure
- Automatic data storage and online visualisation
- Two probes available with 95 mm diameter
- Test depths down to 400 m
- Can also be used in dry boreholes



Dilatometer test for investigating the ground conditions for the future S1-free-way near Vienna

Field of Application

Determination of rock characteristics in the course of exploratory programmes provides significant basic data for planning of underground construction projects. The dilatometer test serves to investigate the deformation behaviour of the rock in situ by widening a borehole section. The test results characterise the rock parameters and form the basis for rock classification.

Principle of Operation

The test method is based on the application of pressure via a borehole probe to widen a certain borehole section and measure this widening. In this way, the deformation characteristic of the rock in the region of the stressed section can be determined. Since the measurement is carried out using 6 independent displacement transducers arranged at 60° angles to each other, directional borehole radii data can be obtained, yielding information on the deformation characteristics in a horizontal plane. A built-in compass measures the spatial orientation of the results. The use of compressed air instead of oil to create pressure enables its application in protected regions and in groundwater as well.



Installation of the dilatometer-probe

Dilatometer Tests

Procedure

The borehole in the chosen test section must first be widened to the required diameter. If the rock is not sufficiently stable, the borehole must be equipped with casing down to the test section. If necessary, the borehole must be cemented in the test section and re-bored again. After the preparatory bore of 2.5 m – 3.5 m, matched to the probe diameter of 95 mm, has been prepared, the borehole walls are initially subjected to a low pressure to allow the membrane to rest against the borehole wall. The actual test generally comprises several loading and unloading cycles at increasing pressures.

The dilatometer tests can be carried out as pressure tests or as creep tests at constant load.

Data acquisition

The results of the measurements are saved at 10 sec. intervals during the test and displayed online and graphically on a screen. The data are analysed in real time and the results displayed in tabular and graphical form (deformation per transducer or diameter as a function of pressure).

Technical specifications

Type:
Cambridge Insitu High Pressure Dilatometer

Diameter: 95 mm
 Total length: 2.030 mm / 1.800 mm
 Length of expansion range: 575 mm / 455 mm
 Maximum pressure: 200 bar

Position measurement:

6 deflector arms equipped with strain gauges arranged at 60° in a horizontal level. The value emitted corresponds to a function of the radius of the membrane. The drilling hole diameter can therefore be measured in three axes.

Expansion volume:

A 45% deformation corresponds approximately to an 80% change in volume (rated AE 99 mm) / 26% deformation.

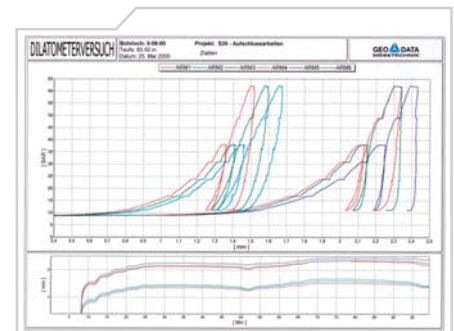


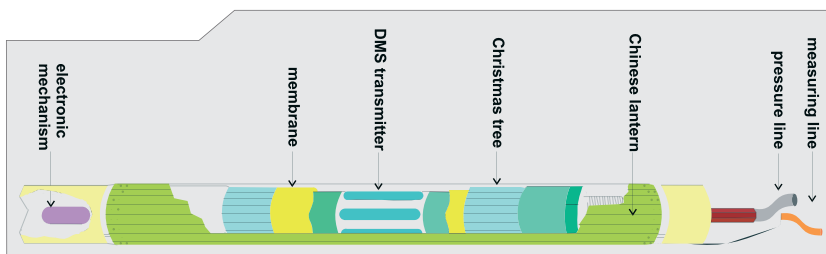
Diagram showing all 6 transducers (pressure/displacement)

Dilatometer Tests

- ❑ **Pressure medium:**
Compressed air with a pressure regulator
- ❑ **Electronic mechanism:**
Includes a microprocessor-controlled multiplexer, fluxgate magnetometer compass, 16-bit analogue/digital converter and RS232 transmitter
- ❑ **Membrane:**
The standard membrane is a 6 mm thick sleeve tube as the pressure unit.
- ❑ **Membrane protection:**
An 18-strip non-corroding protective sleeve (Chinese lantern)
- ❑ **Connection to surface:**
Is a 13 mm high-pressure hose as an electrical cable (voltage supply and RS232 connection). The exterior sleeve is reinforced for gas operation to guarantee protection from leaks. An 11 mm return hose is provided for oil operation for improved escape.



Control unit for gas-operation



Basic sketch of probe configuration