

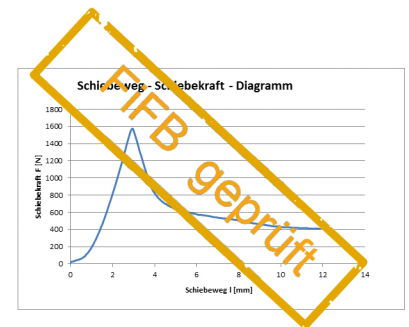
## Tests in general

Our high-performance testing laboratory, which regularly carries out tests on RSS Flüssigboden, guarantees the use of quality-controlled additives. We only use Compound types with suitable and tested properties. In addition to high quality testing, our focus is on mix design development, consulting and product development. We also offer supervision services in the area of RSS Flüssigboden at the highest level.

## Push-through tests

The testing of the push-through resistances of RSS Flüssigboden is based on the concept of the laboratory for geotechnics of the Regensburg University of Applied Sciences using the practical experience of LOGIC Logistic Engineering GmbH and the corresponding research results of FFI, FiFB, and AGFW. The axial contact forces are measured by means of a rod shear test. The maximum forces determined essentially result from adhesion to the contact surface between liquid soil and PEHD pipe and from relaxation effects.

As part of the test preparation, the liquid soil is prepared for the mix design development and placed in pipe sections DN 150, L = approx. 35 cm. The PEHD pipes with a diameter of 0.075 m are positioned centrally in the liquid soil and fixed from both sides with a ring. The specimens are stored at room temperature until the start of the test. The test is carried out after 7/28 days with the universal testing machine UP 25. The measurement data recording is performed using the Geolab software. All tests are carried out path-controlled. Each specimen is opened immediately before the test, documented photographically, and installed vertically centrally in the UP 25 test press. The installed PEHD pipe is pushed through by at least 5 mm using a load stamp. The test speed is 0.25 mm/min. The test set-up is sketched in Fig. 1. The maximum push-through resistance is measured at  $F_{max}$ , at which the "sliding" of the pipe begins after the state of "adhesion". When the pipe starts to move, the push-through force drops and reaches an approximately constant value during the measurement, the frictional resistance (FR). The tension  $\tau_{max}$  is calculated from the push-through forces, the known pipe mass, and the surface area of the contact between the liquid soil and the PEHD pipe.



## Key data

- typical values of liquid soil optimized for district heating pipes:  $\tau_{max}$ : 6.5-28 kN/m<sup>2</sup>, FR: approx. 15-30% of  $\tau_{max}$  depending on mix design/soil
- Please note that the test results refer to 1 m<sup>2</sup> outer pipe diameter. For the breaking point between T-PUR and pipe, the outer pipe diameter and the insulation thickness must be taken into account.

## Costs Testing of push-through resistances on RSS Flüssigboden®

- As part of a mix design development: from €270 per test specimen. Three test specimens required per mix design.
- Single test of already created test specimens: from 210 € per test specimen.

You will find our current price list on our website. Please also refer to our product information sheet "RSS Mix Design District Heating".

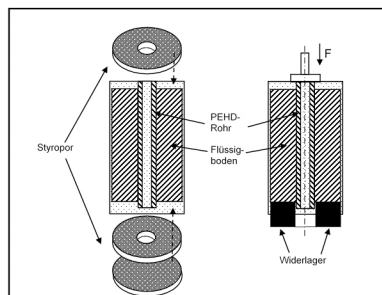
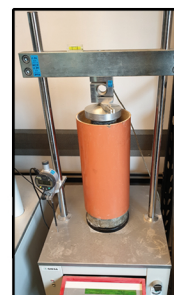


Figure 1: Draft of the test set-up



test procedure

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