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Methods to measure and determine static and dynamic / kinetic friction

In all technical processes friction plays a central role. An important variable is the friction coefficient, $\mu = F_R/F_N$, which is composed of frictional force FR and normal force FN. We distinguish also between the static μ0 (no relative motion) and dynamic (kinetic) friction μ (with relative motion). In engineering physics, the dynamic friction force is described as speed-independent. With the presence of lubricants the rules are different and there is a speed-dependent component, which depends on the viscosity of the lubricant. Since other factors such as surface pressure and surface characteristics play a role, it would not be good practice to confirm friction value without conducting investigative experiments. Gausstec guarantees accuracy by testing with valid state-of-the-art equipment and by imposing strict testing conditions.

How does the Gausstec Laboratory conduct the measurement of static and dynamic friction coefficient?

The test setup consists of a single-axis motorized table and a carriage. The sliding partners can be attached to the motorized table and to the carriage and can be moved against each other.

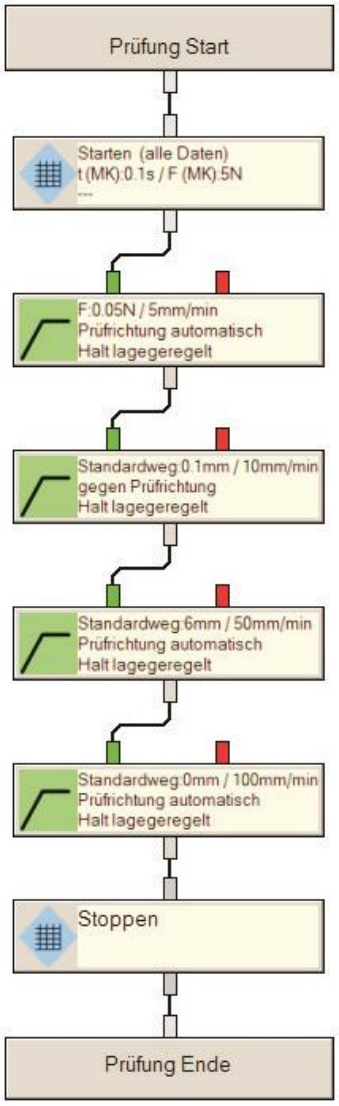

Fig. 1: Testing procedure

The measurement of the friction coefficient will expire according to a specific test method. First the carriage is moved up to the response of the force sensor and then released. After a short break, the recording of friction force F_R starts. To eliminate acceleration forces, F_R is not measured at the motorized table but at the fixed carriage. For evaluation the normal force F_N must also be known. The static friction is usually the highest value in the curve (See Fig. 2). For the dynamic friction the determination uses the mean value of sliding friction force in a specified sliding distance. The resulting graph shows the numerical results of the individual measurements (See Fig. 3). So the long and short term reproducibility of the measurements are illustrated. The results are recorded and displayed immediately after the measurement. Therefore it is possible to detect changes in the sample state immediately.

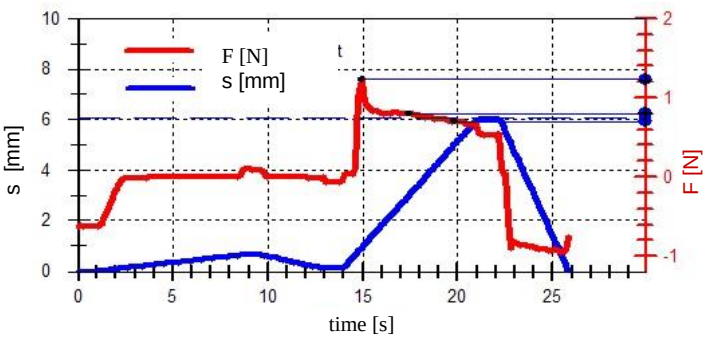

Fig. 2: Curve tracing of a single measurement for force recording (red line).

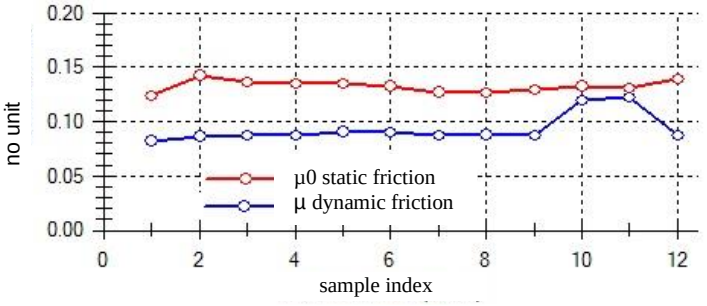

Fig. 3: Result graph consisting of 12 individual measurements with the results of static friction (red line) and the sliding (kinetic) friction (blue line).

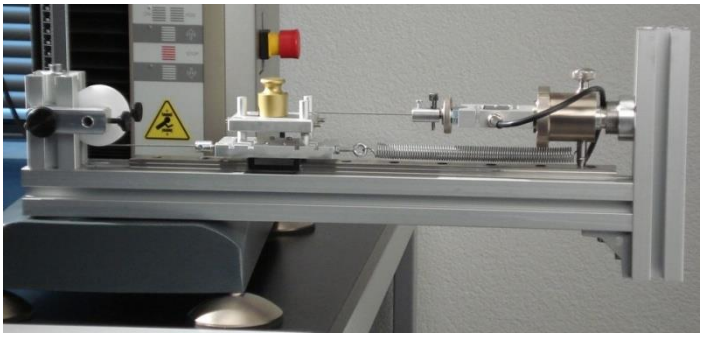

Fig. 4: Equipment

Equipment for friction coefficient measurement

Gausstec has the following facilities for the determination of friction coefficient:

- Testing machine Zwick Z0.5 with test code for friction speeds to 500 [mm / min], friction coefficient with individual sample analysis.
- Friction measurement equipment with horizontal carriage for measuring sections up to 60 [mm], test set for various sliding partners, horizontal load cell for measuring forces 0 - 10 [N], frequency up to 0.5 [Hz].

Your comments and questions about friction are important to us! For more information about Gausstec and our services please give us a call + 41(0)32 682 1565