

## 32967 Sliding Friction

### Purpose:

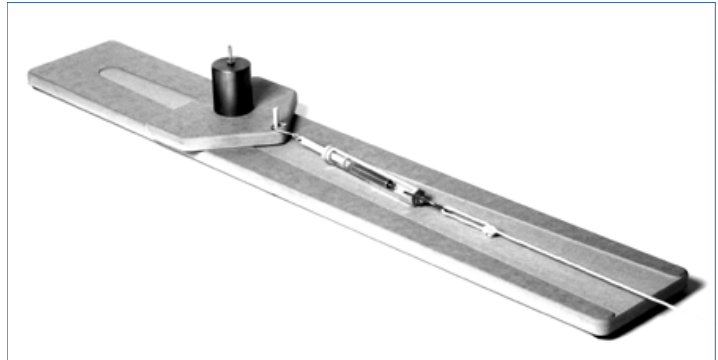
To investigate the circumstances that control friction between two sliding surfaces, specifically to focus attention on the contact area between the two surfaces by allowing this area to continuously change during the demonstration.

### Required Accessories:

Masses, Spring Balance or an equivalent Force Probe.

### Discussion:

A towing sled is pulled across a surface that has a wedge of material missing so that the contact area continuously changes. While friction in real terms is quite complicated, some introductory notions seem to be demonstrable, such as:  
Friction Force depends on the nature of the two surfaces.  
Friction Force depends on the normal force.  
Friction Force is independent of the contact area.  
Static Friction Force is greater than Sliding Friction Force.



It will be necessary to point out that surface imperfections will cause small fluctuations in the reading of the force applied, but for each mass carried on the sled and each surface configuration, the readings will remain fairly constant

The nature of the two surfaces can be changed by taping a large enough piece of paper or other material to either of the sliding surface. Make sure that the tape does not interfere or leave residue on the sliding surface.

The normal force can be varied by adding laboratory masses to the sled.

It is important that the break away occurs promptly, but that the sled does not accelerate across the base structure. There must be no net force, if the reading is being considered as due to friction only.

### Further Discussion:

Some will assert that the contact area does matter because they will be thinking of racing slick tires and heavy duty brake pads and brake shoes. In both of these instances, the larger area is required to dissipate heat which will eventually effect the nature of the two surface. Another way in which race car drivers change the nature of the two surfaces is by “burning rubber” in the place on the track where they will be starting. Apparently rubber to rubber is better than rubber to the regular racetrack surface. The fact that sliding friction is less than static friction becomes important in using automobile brakes. One can stop in a shorter distance if the brakes are very close to “locking up,” but not to the point of causing a skid. Modern ABS systems make use of this idea.

### Time Allocation:

To prepare this product for an experimental trial should take less than ten minutes. Actual experiments will vary with needs of students and the method of instruction, but are easily concluded within one class period. It may be necessary to periodically provide a light sanding for the two sliding surfaces with a very fine sandpaper that is attached to a flat block (and not held in the hand) to keep the surfaces free of grime and tape residue.

### Feedback:

If you have a question, a comment, or a suggestion that would improve this product, you may call our toll free number.

