

Forces and work
Friction

Sliding friction force

Objects of the experiments

1. Investigating the dependence of the sliding friction force on the gravitational force of the body
2. Investigating the dependence of the sliding friction force on the surface condition of the body
3. Investigating the dependence of the sliding friction force on the size of the bearing area of the body

Setup



Picture 1



Picture 2



Picture 3

Apparatus

| | |
|---|---------|
| 1 Wooden blocks for friction experiments, pair | 342 10 |
| 3 Weights, 0.2 kg | 683 11 |
| 1 Precision dynamometer, 1 N..... | 314 141 |
| 1 Precision dynamometer, 2 N..... | 314 151 |

Carrying out the experiments

1. Dependence on the gravitational force:
 - Determine the gravitational force of the smaller wooden block by means of the dynamometer 2 N.
 - Set up the experiment as shown in picture 1.
 - Make the wooden block move by pulling the dynamometer horizontally.
 - Read the pulling force at the dynamometer.
 - Then put additional weights on the block one after another, and read the pulling forces.
2. Dependence on the surface condition:
 - Set up the experiment as shown in picture 2.
 - Make the wooden block move by pulling the dynamometer horizontally.
 - Read the pulling force at the dynamometer.
 - Turn the wooden block so that the rubber coated side lies on the table.
 - Repeat the experiment.

3. Dependence on the bearing area:

- Put the wooden block on the table so that it rests on a smaller lateral face as shown in picture 3 and make it move by pulling the dynamometer.
- Read the pulling force.
- Repeat the experiment with a greater lateral face.

Measuring example

The amount of the pulling force read at the dynamometer corresponds to the frictional force.

1. Dependence on the gravitational force:

| Gravitational force G in N | Frictional force F_R in N | $\frac{F_R}{G}$ |
|---------------------------------|--------------------------------|-----------------|
| 1.8 | 0.6 | 0.33 |
| 2.0 | 0.7 | 0.35 |
| 2.2 | 0.75 | 0.34 |

2. Dependence on the surface condition:

| Surface | Frictional force F_R in N |
|---------|-----------------------------|
| Wood | 0.25 |
| Rubber | 0.85 |

3. Dependence on the bearing area:

| Bearing area | Frictional force F_R in N |
|--------------|-----------------------------|
| Small | 0.25 |
| Large | 0.25 |

Evaluation

1. The sliding friction force depends on the gravitational force of the body. The two forces are proportional: $F_R \sim G$.
2. The sliding friction force depends on the surface condition of the body. The rougher the surface, the rougher the frictional force.
3. The sliding friction force does not depend on the bearing area of the body.