# Friction (Item No.: P1000300)

## Curricular Relevance

**Area of Expertise:** Physik
**Education Level:** Klasse 7-10
**Topic:** Mechanik
**Subtopic:** Kräfte, einfache Maschinen
**Experiment:** Reibung

| Difficulty | Preparation Time | Execution Time | Recommended Group Size |
|---|---|---|---|
| Intermediate | 10 Minutes | 10 Minutes | 2 Students |

**Additional Requirements:**

- Paper underlay
- Sandpaper underlay
- Wooden underlay

**Experiment Variations:**

**Keywords:**

## Task and equipment

## Information for teachers

## Additional Information

With the aid of the friction block the students should observe that different surfaces result in different frictional forces. The sliding properties of the interacting surfaces should be especially stressed.
Further, the difference between static friction and sliding friction should become clear.
Especially important for technical applications is the realisation that rolling friction is substantially less than sliding friction.

## Remark

The rolling friction experiment requires considerable care due to the small forces involved – especially for the measurements during the motion phase.

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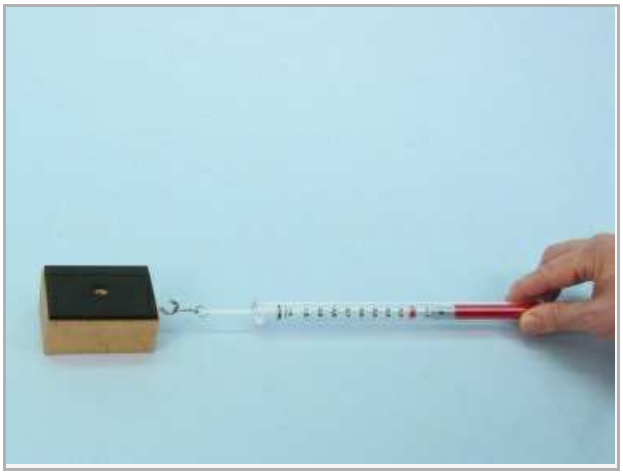
## Task and equipment

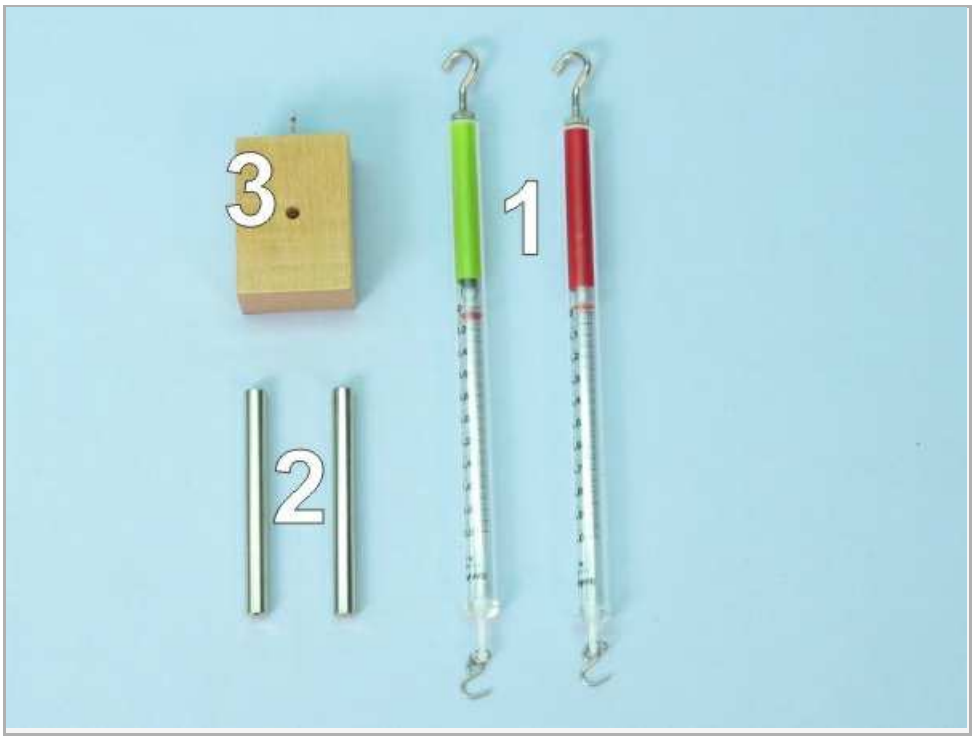
### Task

### Why do vehicles have wheels?

When an object is moved across a surface, forces occur.
You will measure these forces at the beginning of motion and during the motion on different surfaces, both smooth and rough.
You will also measure the forces during rolling motion.



## Equipment




| Position No. | Material | Order No. | Quantity |
|---|---|---|---|
| 1 | Spring balance,transparent, 1 N | 03065-02 | 1 |
| 1 | Spring balance,transparent, 2 N | 03065-03 | 1 |
| 2 | Support rod with hole, stainless steel, 10 cm | 02036-01 | 2 |
| 3 | Friction block | 02240-01 | 1 |
| Additional material | | | |
| | Paper underlay | | |
| | Sandpaper underlay | | |
| | Wooden underlay | | |

## Set-up and procedure

- Place the friction block on the table top with its wooden side facing down, and attach the 1 N spring balance to its hook (Fig. 1).
- Measure the force EM>$F_1$ which acts as the friction block just starts to move and record its value in Table 1.
- Measure the force $F_2$ which acts on the friction block when it is moving uniformly and record its value in Table 1, too.
- Turn the friction block over so that its rubber-covered side is facing down, attach the 2 N spring balance to its hook and remeasure the forces $F_1$ and $F_2$ (Fig. 2). Record these values in Table 1 as well.

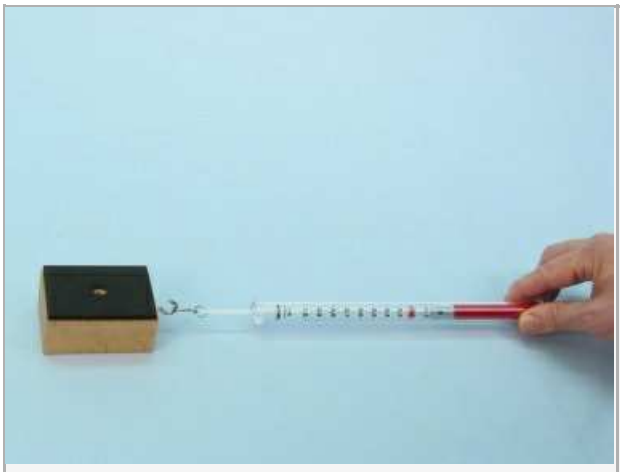


Fig. 1

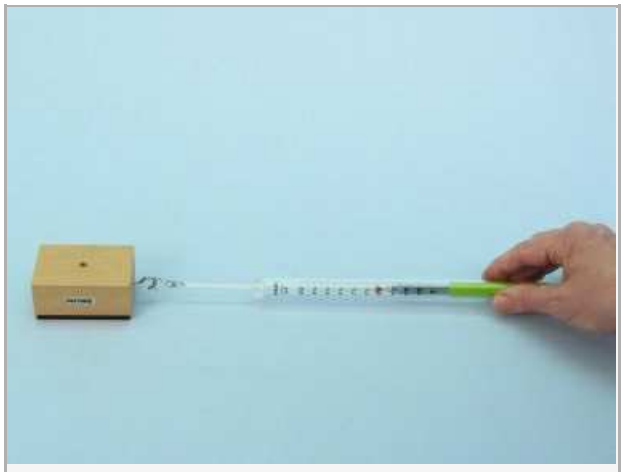


Fig. 2

- Place the short support rods under the rubber side of the friction block, so that they may serve as wheels. Hook the 1 N spring balance into the block and try to measure the force $F_1$ at the beginning of motion and $F_2$ during motion. You will have to pull carefully because the rods will not remain underneath the block for a long time!
- Record the measured values in Table 1.

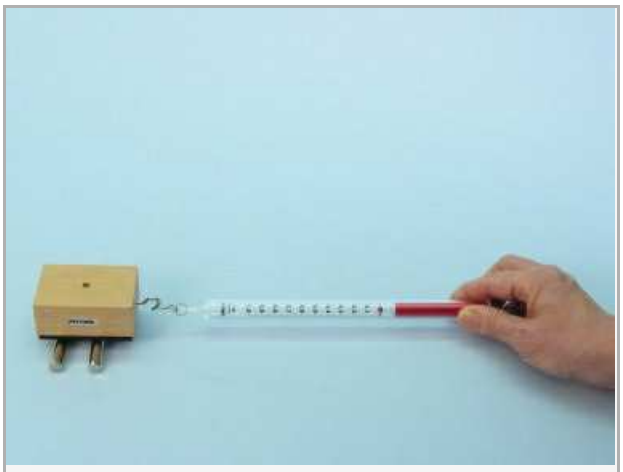


Fig. 3

- Now place the friction block on each of the three underlays (paper, wood, sandpaper), one after the other. Hook the 2 N spring balance into the block and, for each underlay, measure the force $F_2$ during uniform motion (Fig. 4).
- Record the measured values in Table 2 in the report.
- Turn the friction block over onto its rubber side and repeat the measurements of $F_2$ on paper, wood and sandpaper. Record the measured values in Table 2.

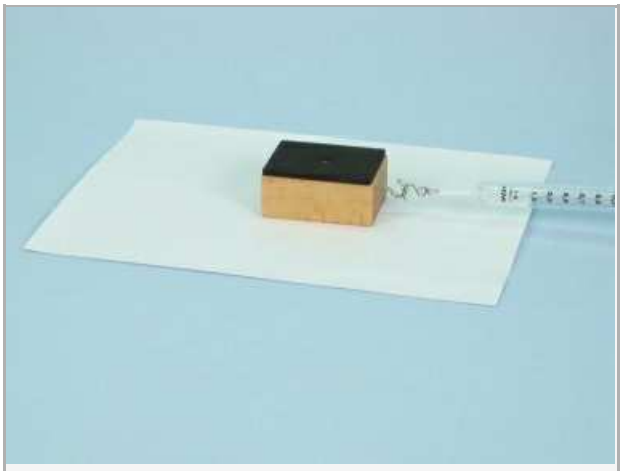


Fig. 4

# Report: Friction

## Results – Table 1

Enter the measured values in the Table 1.

| Force | Frictional surface | | |
|---|---|---|---|
| | Wood | Rubber | Rods as wheels |
| $F_1$ in N | 0 | 0 | 0 |
| $F_2$ in N | 0 | 0 | 0 |

## Results – Table 2

Enter the measured values in the Table 2.

| Underlay | Frictional surface | |
|---|---|---|
| | Wood | Rubber |
| Paper | 0 | 0 |
| Wood | 0 | 0 |
| Sandpaper | 0 | 0 |

## Evaluation – Question 1

Is there a difference between the forces $F_1$ and $F_2$ in your measured values?

## Evaluation – Question 2

Can you explain this difference?

## Evaluation – Question 3

Why do we use wheels on vehicles?

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## Evaluation – Question 4

Ice is very slippery. What can one do to avoid losing one's footing on it?

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