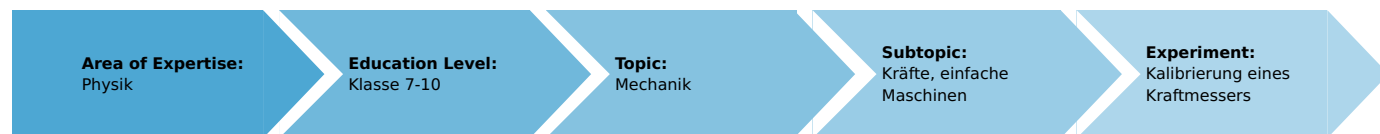


Calibration of a dynamometer (Item No.: P0999300)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- Felt-tip pen

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Additional Information

The students should add a scale to an uncalibrated spring balance by loading it with mass pieces. In doing so they should know that a mass of 100 g represents a weight (force) of 1 N in the gravitation field of the earth.

Remark

The term "(slotted) weight" is incorrect since we are dealing with a mass which becomes a weight (actually a "weight-force") under the influence of gravity. The term "mass piece" would be better.

Calibration of a dynamometer (Item No.: P0999300)

Task and equipment

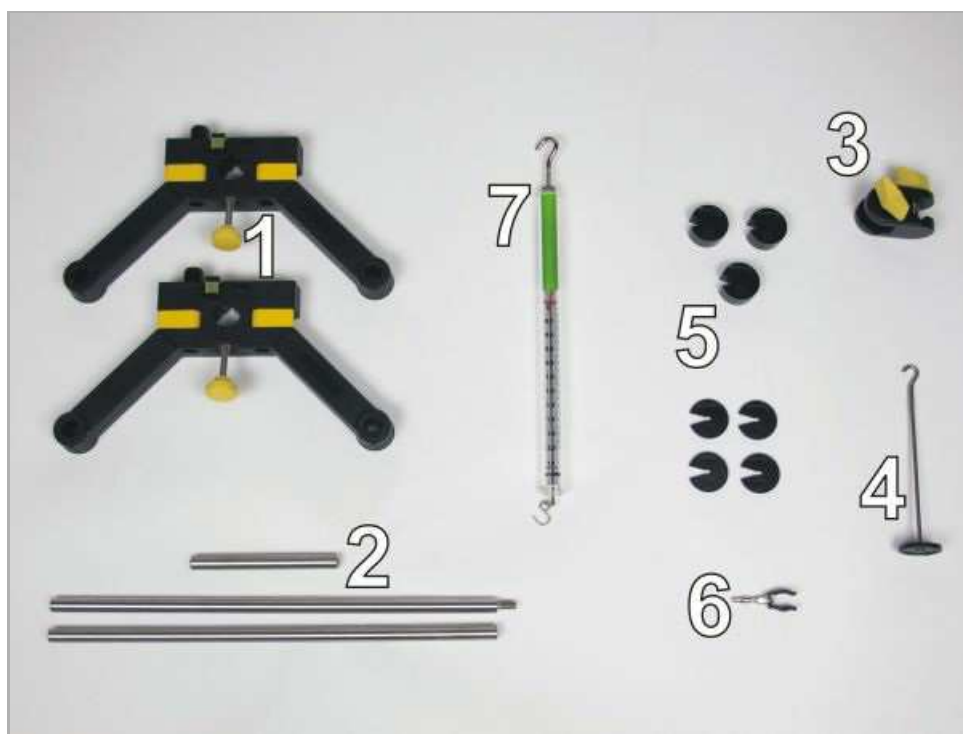
Task

How does a spring balance get its scale?

You will add a scale to an uncalibrated spring balance by loading it with mass pieces.



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod with hole, stainless steel, 10 cm	02036-01	1
2	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	1
3	Boss head	02043-00	1
4	Weight holder for slotted weights	02204-00	1
5	Slotted weight, black, 10 g	02205-01	4
5	Slotted weight, black, 50 g	02206-01	3
6	Spring balance holder	03065-20	1
7	Spring balance, transp., 2N, non-adj	03065-09	1
Additional material			
8	Felt-tip pen		

Set-up and procedure

Set-up

First screw the split support rod together (Fig. 1). Set up a stand with the support base (Fig. 2), the 600 mm support rod (Fig. 3) and the bosshead (Fig. 4).



Fig. 1

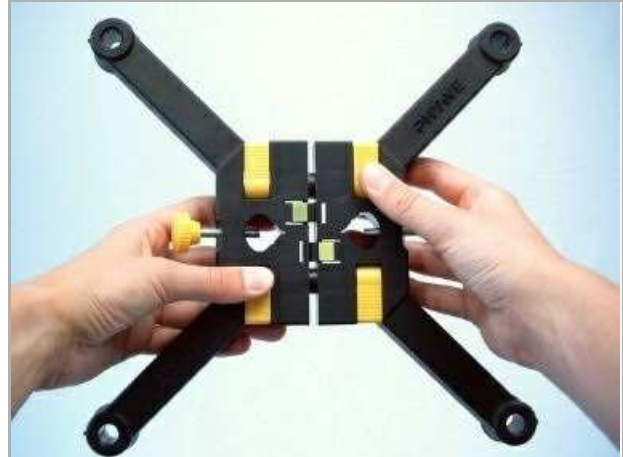


Fig. 2



Fig. 3



Fig. 4

Insert the spring balance holder into the short rod (Fig. 5) and clamp the latter into the bosshead (Fig. 6). Hang the spring balance with its small screw in the spring balance holder in such a way that it cannot slip downwards (Fig. 7).



Fig. 5

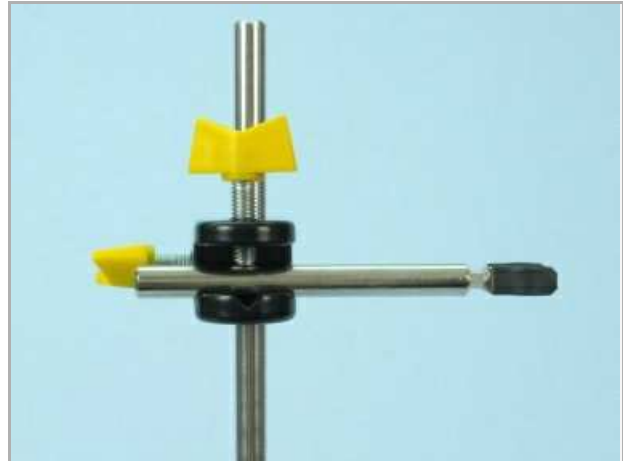


Fig. 6



Fig. 7

Procedure

- Set the zero mark about 2 cm below the green sleeve and mark its location with the felt-tipped pen on the transparent part of the casing.
- Hang the slotted weight holder on the spring balance. Its mass m is approx. 10 g, which corresponds to a weight (force) F_g of 0.1 N. Mark the position of the indicator.
- Now increase the mass in 10 g increments. To do this, put a slotted weight onto the weight holder by slipping it over its top end (Fig. 8).
- For each 10 g mass increment, mark the position of the indicator on the spring balance. Label the markings with the corresponding values for the weight (force) F_g in N.
- Fig. 9 shows the slotted weight holder hanging from the spring balance with a few slotted weights on it.



Fig. 8



Fig. 9

In order to disassemble the support base you should press the yellow buttons (Fig. 10).



Fig. 10

Report: Calibration of a dynamometer

Evaluation - Question 1

What is the measuring range of the calibrated spring balance?

Evaluation - Question 2

Which mass corresponds to a weight (force) of 1 N in the gravitation field of the earth?

Evaluation - Question 3

How could you achieve a finer division of the scale?

Evaluation - Question 4

Is the scale linear? (Consider Hooke's Law.)
