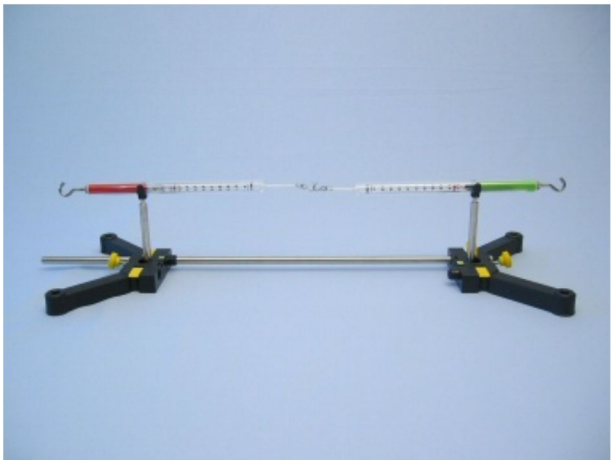
2.2 Force and reaction

Task

Does a spring balance need a retention force?

Two spring balances are connected via their measuring hooks to one another. The force that they exert on each other is measured at different distances.



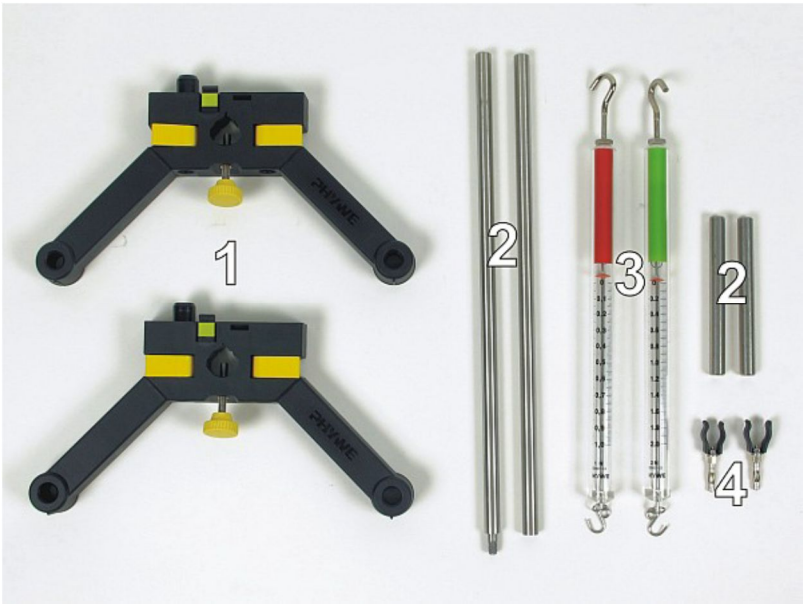
Use the space below for your own notes.

Material

Material from "TESS advanced Physics Set Mechanics 1, ME-1" (Order No. 15271-88)

Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod with hole, stainless steel, 100 mm	02036-01	2
2	Support rod, split in 2 rods, *l* = 600 mm	02035-00	1
3	Spring balance, transparent, 1 N	03065-02	1
3	Spring balance, transparent, 2 N	03065-03	1
4	Spring balance holder for transparent Spring balances	03065-20	2

Material required for the experiment



Setup

First of all screw the two splitted rods together (Fig.1). Connect the two halves of the support base with the long support rod and tighten the locking lever on the left half (Fig. 2). Insert the spring balance holders into the short rods (Fig. 3).

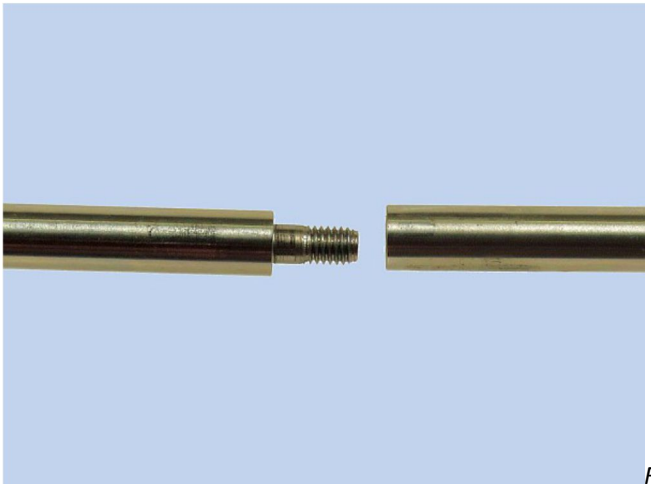


Fig. 1

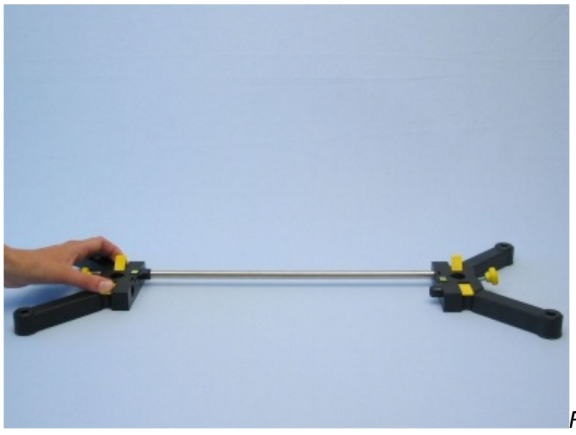


Fig. 2

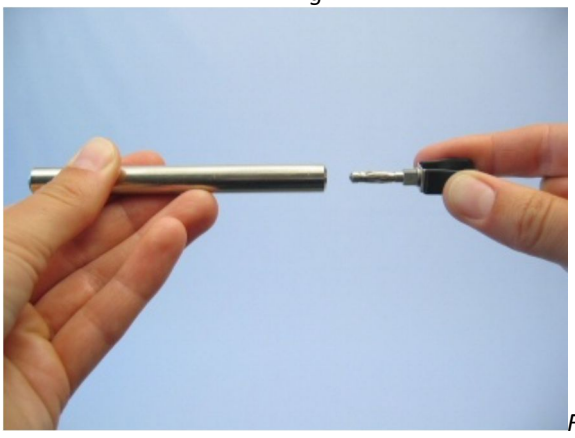


Fig. 3

Then set the two support rods into the support base halves (Fig. 4). Clamp the two spring balances into place, adjust them to zero (see Remark) and connect their weighing hooks (Fig. 5).

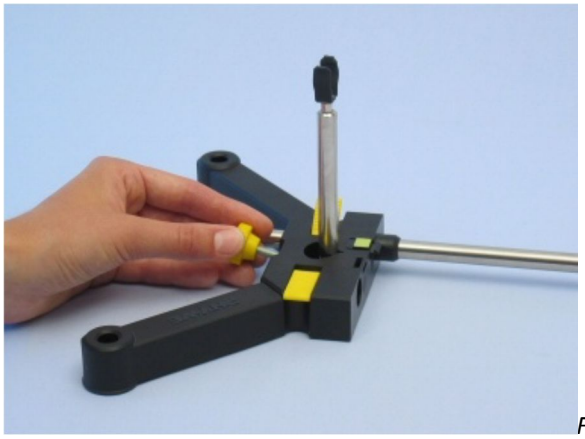


Fig. 4

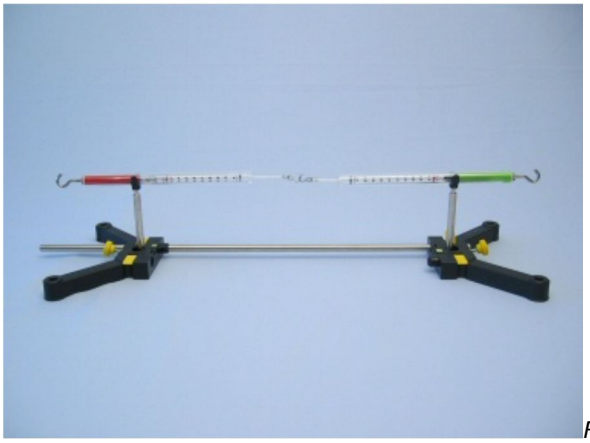


Fig. 5

Remark:
To adjust the spring balances pull on the weighing hook of each spring balance several times and then release it suddenly. If they do not return to zero, you must adjust them (Fig. 6).

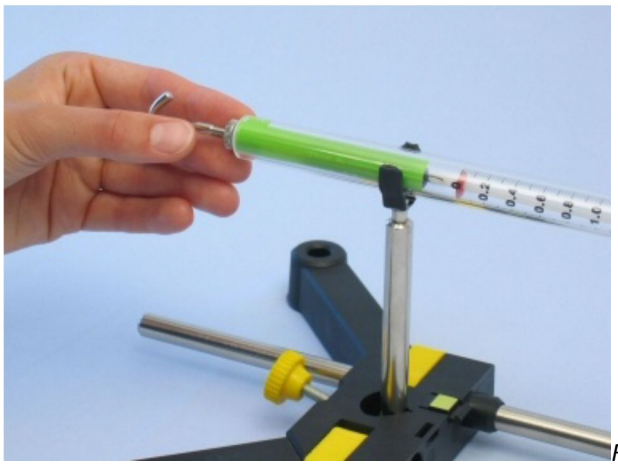


Fig. 6

Action

Pull each of the two spring balances out to about 2/3 of their length, pay attention to their effect on your hands (Fig. 7).

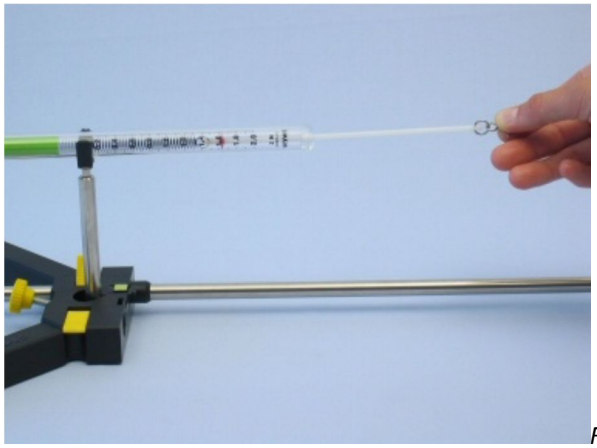


Fig. 7

Results

Note your observations

Hold the left support base half and pull the two spring balances apart with the right one (Fig. 8). Read the scales of both spring balances about every two centimetres and record the values in Table 1 in the Results page. Determine 5 pairs of values. In Fig. 9 you can see, how to name the forces for the Table 1.

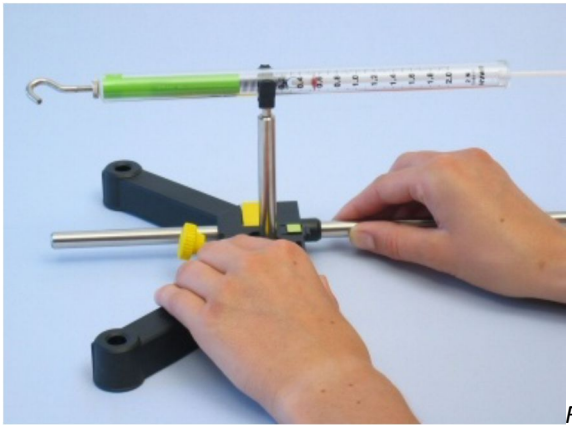


Fig. 8

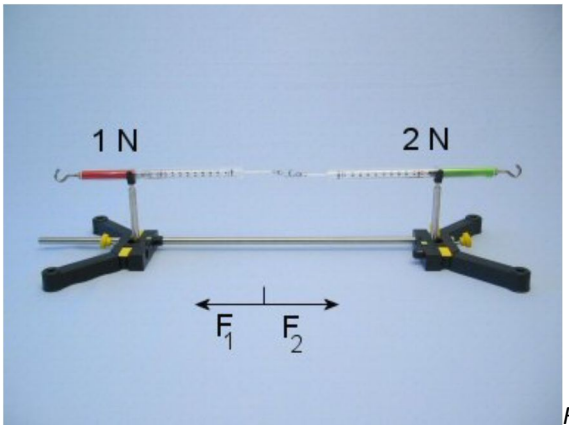


Fig. 9

Table 1

Spring balance	1 N	2 N
Measurement	F_1 in N	F_2 in N
1		
2		
3		
4		
5		

Evaluation

Question 1:

What do you notice, when you attach a spring balance to a solid object (e.g. table, window) and pull on it?

Can you also pull it out when one end is unattached?

Question 2:

Compare the two forces F_1 and F_2 with each other. What do you establish?

Does a spring balance need a retention force?