



Material

Item-no.	Qty.	Description
DS101-3B	1	Stand rail with scale, L=1000 mm
DM300-2A	1	Dynamics trolley, demo, 50 g
P1312-2A	1	Car body for trolley SE
P3120-2Z	1	Universal timer "inno"
P3120-5B	1	S-shaped assembly platform
P1320-4A	1	Light gate "demo" 04
P1321-3K	2	Block for light gates
DS103-1H	1	Holder for guide rail
DM362-1E	1	Baffle block
DM344-1S	1	Projectile launcher 02

Purpose

To explain the concept of impact and its effect on the impacted body

$$\mathbf{F} \times \mathbf{t_s} = \Delta \mathbf{m} \times \mathbf{v}$$

Preparation

Position the two blocks for light gates at a distance of 90 cm on the table and place the light gate in between the blocks as shown on the image to the left.

Place the stand rail with scale on the blocks for light gates.

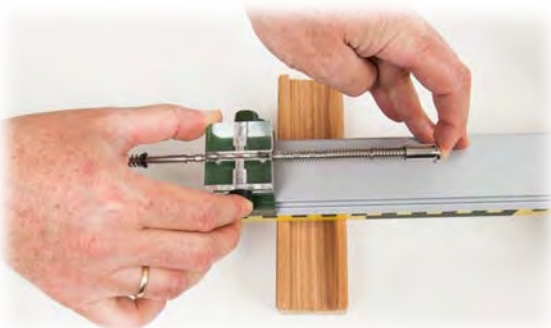
Mount the projectile launcher on the left end of the stand rail. Afterwards mount the holder for guide rail on the right end of the stand rail and fix the baffle block on the holder.



Place the car body on the dynamics trolley; make sure that the small rod of the trolley points through the hole of the car body.

Initially the launching piston of the projectile launcher is fully extended; place the dynamics trolley at the end of the launching piston.

Position the light gate so that the diodes of it are just in front of the dynamics trolley (approximately at the 32 cm mark).

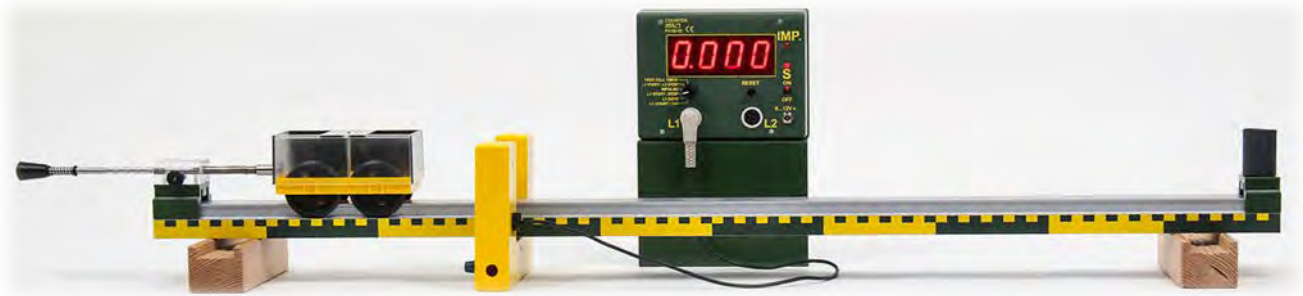


Push the launching button of the projectile launcher in and pull up the launching piston, fix the piston at the 4th or 5th notch.

Place the universal timer on the S-shaped assembly platform.

Connect the light gate with the "L1"-socket of the universal timer and set the switch on the universal timer to "L1 Gate".

Experiment



Push the dynamics trolley completely against the launching piston.
By pushing the launching button the dynamics trolley gets pushed away.

The universal timer measures the "darkening time" - the time in which the trolley moves through the laser barrier of the light gate.



Based on the length of the dynamics trolley (125 mm) and the darkening time the current speed of the dynamics trolley can be calculated

$$0.125 \text{ m} / \dots\dots\dots \text{ s} = \dots\dots\dots \text{ m/s}$$

Measure the speed of the dynamics trolley after it has been "launched" (= the impact) at different spring tensions of the launching piston.

Conclusion

An impact is a brief application of force. The body is accelerated for a time t_s during the impact. The acceleration effect (change in the speed of the body) increases with the force and the duration t_s . With a large impact, a large mass can be given a high speed. The impact is therefore proportional to the change in the product $m \times v$ - the momentum.

Note

If the mass of the dynamics trolley is also taken into consideration the change of momentum $m \times v$ is known and thus the impact time can be calculated by the average force acting on the spring or the average force of the spring can be calculated by the impact time.