

Physics

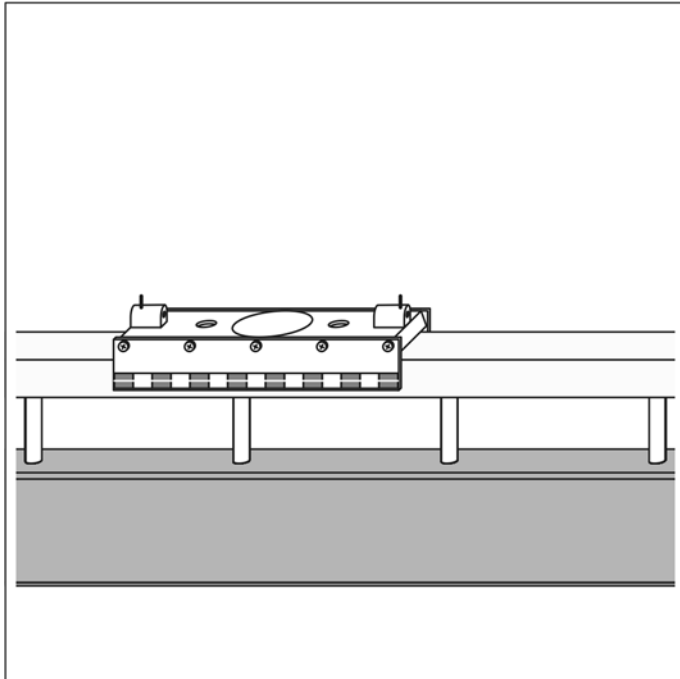
Chemistry · Biology

Technology



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06/05-W97-Sel



Instruction sheet 337 501

Linear air track (337 501)

1 Description

With the linear air track, the principles of kinematics and dynamics can be studied for the example of one-dimensional translational motion with sliders that move virtually without friction on an air cushion.

2 Technical data

Track rail with carrier:

Length: 1.5 m

Mass: 7 kg

Track stand:

Height: approx. 5-10 cm
or 38 cm respectively

Slider:

Dimensions: 15 cm × 5 cm × 4 cm

Mass: 88 g

Impact plate, impact spring, tube, needle and holding plate:

Mass: 4 g each

Interrupters:

Mass: 0.5 g

Width: 5 mm

Holding magnet:

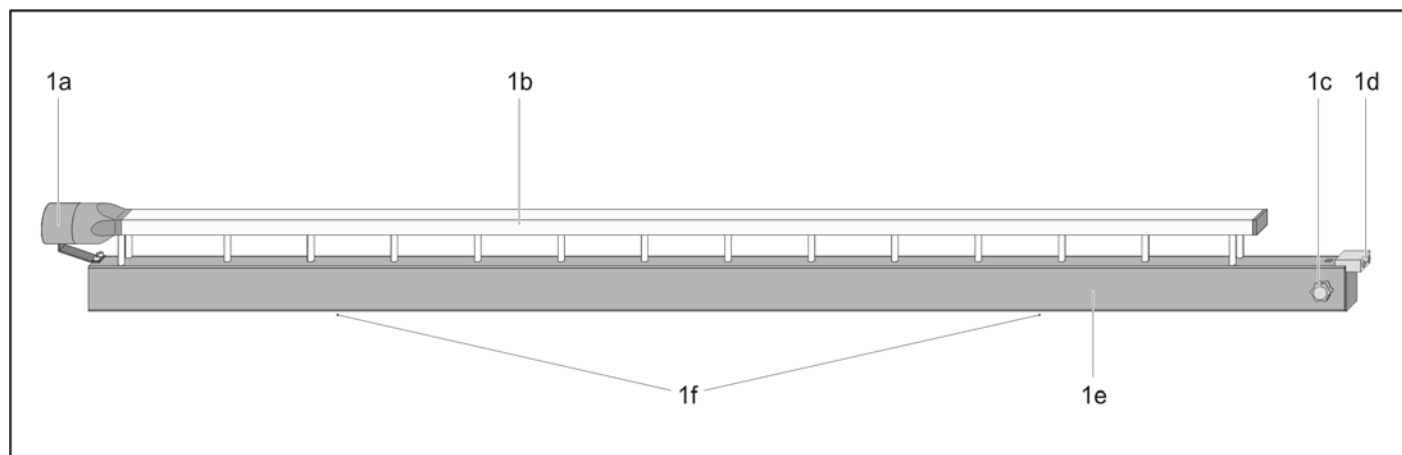
Supply voltage: 5 ... 16 V₋

3 Scope of supply

- 1 track rail with carrier
- 2 inserts, each equipped with
 - 1 slider
 - 4 interrupters
 - 2 100 g weights
 - 8 1 g weights
 - 1 impact plate with plug
 - 1 impact spring with plug
- 1 insert, equipped with
 - 1 tube with plug
 - 1 needle with plug
 - 1 holder for spoked wheel with combination spoked wheel
 - 2 brakes
 - 1 catch plate
 - 1 thread
- 1 adapter for air supply
- 1 holding magnet
- 1 holding plate with plug
- 1 plastic cover
- 1 track stand

4 Components

4.1 Track rail with carrier

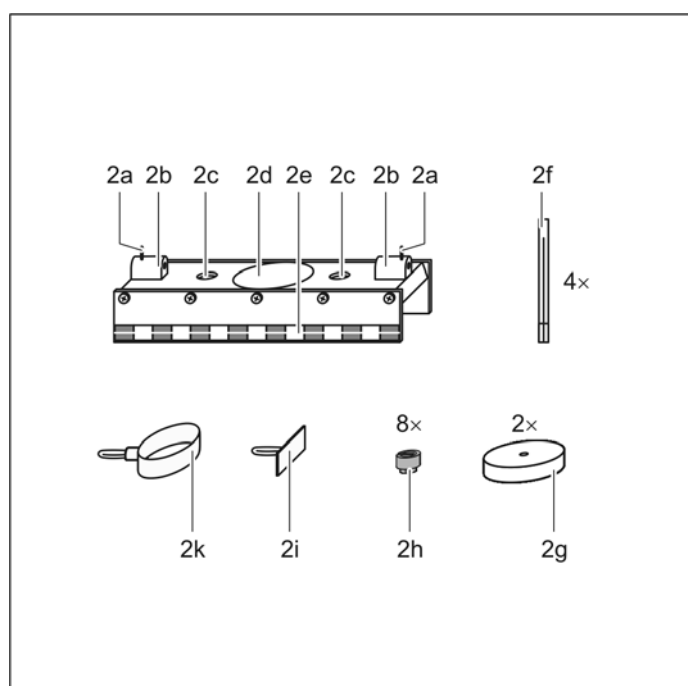


1a air inlet
1b track rail

1c knurled screw
1d 4-mm sockets

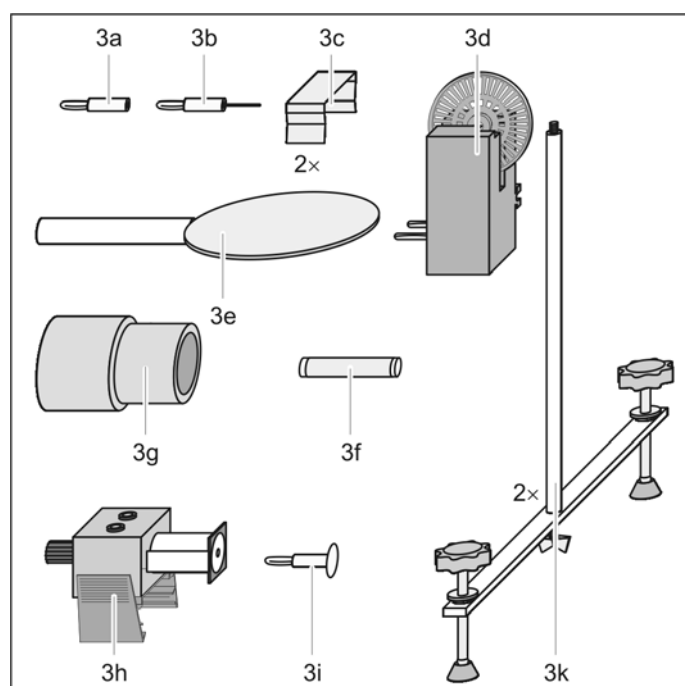
1e carrier
1f threaded bushes

4.2 Slider



2a thread holder
2b bush
2c seat for 1 g weight
2d seat for 100 g weight
2e ledge with scale
2f interrupter
2g 100 g weight
2h 1 g weight
2i impact plate with plug
2k impact spring with plug

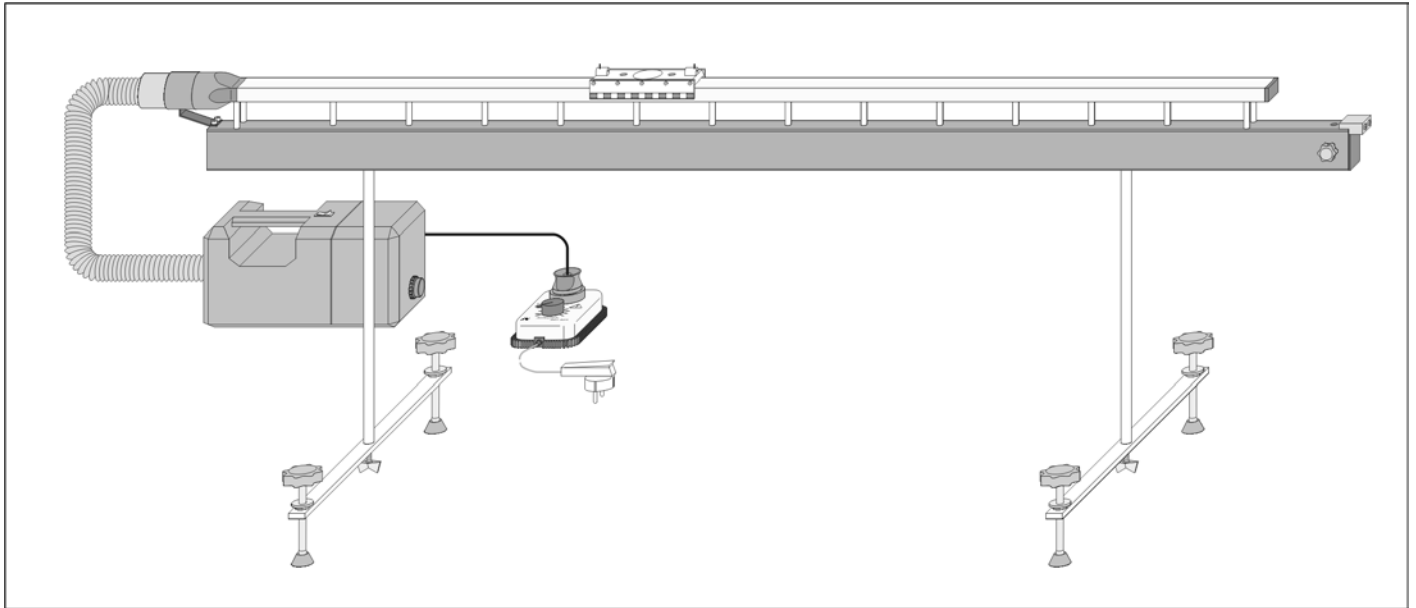
4.3 Accessories



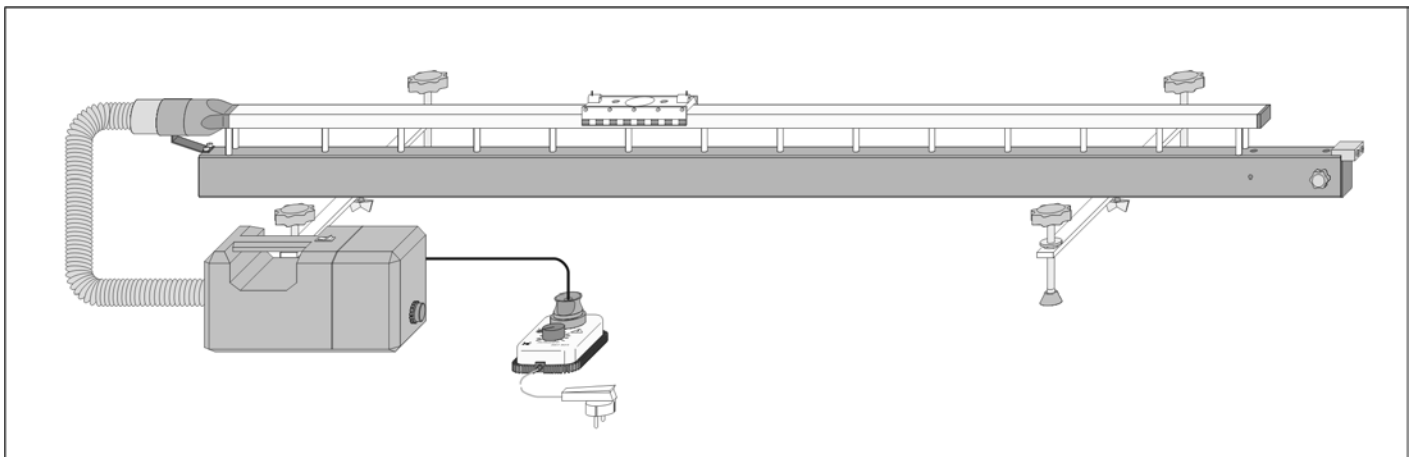
3a tube with plug
3b needle with plug
3c brake
3d holder for spoked wheel with combination spoked wheel
3e catch plate
3f thread
3g adapter for air supply
3h holding magnet with clamping rider
3i holding plate with plug
3k track stand

5 Putting into operation

5.1 High setup



5.2 Low setup



Remarks:

Protect the rail track from mechanical damage, dust and dirtying.

- When carrying the linear air track, hold the carrier only, not the track rail.
- After finishing the experiments, cover the track rail with the plastic cover.

Frictional forces may act on the slider if the air supply is too weak so that the slider rubs the track rail or if the air supply is too strong so that the slider moves unevenly.

- After changing the mass of the slider, readjust the air supply.

additionally required:

1 air supply for air track	337 53
1 power controller	668 823

additionally recommended:

1 air stopper	337 52
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- Mount the linear air track on the track stand, and align it horizontally, e.g. with a spirit level.
- If necessary, plug the air stopper into the air inlet.
- Connect the air supply with the adapter for air supply.
- Set the air supply to its maximum value, and dust the track rail with a brush. See to it that the boreholes are not clogged.
- Reduce the air supply to its minimum value, put a slider on the track rail, and increase the air supply slowly until the slider slides on the rail without friction.
- Adjust the horizontal alignment until the slider remains at rest at several places of the track rail.
- If necessary, clamp a brake at both ends of the track rail.

6 Uniform motion and uniformly accelerated motion

6.1 Newton's first law (demonstrating inertia)



additionally required:

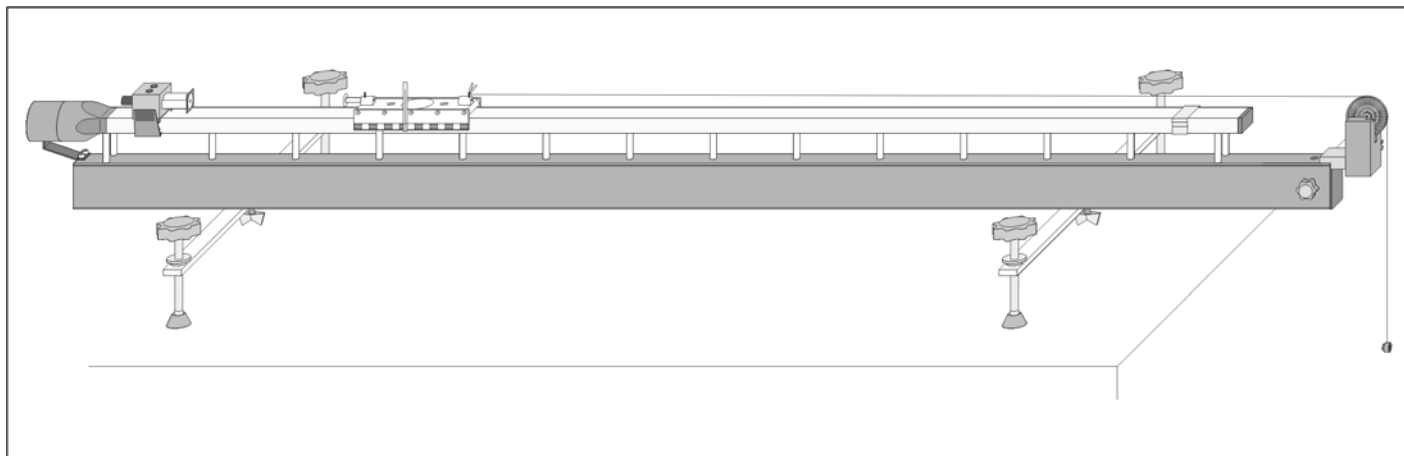
1 stand rod e.g. 300 43
1 Leybold multiclamp 301 01

additionally recommended:

1 scale 311 02

- Clamp the holding magnet.
- Equip a slider with the holding plate and interrupters.
- Attach the holder for spoked wheel with combination spoked wheel and mount the catch plate at the stand rod.
- Attach the thread to the thread holder of the slider, guide it around the pulley and suspend a 1 g weight from it.
The distance between the propelling weight and the catch plate determines the acceleration distance.

6.2 Uniformly accelerated motion



additionally required:

1 stand rod, 25 cm 300 41

additionally recommended:

1 scale 311 02

- Clamp the holding magnet.
- Equip the slider with the holding plate, interrupters and 1 g weights.
Determining the mass of the slider: see technical data.
- Attach the holder for spoked wheel with combination spoked wheel.
- Attach the thread to the thread holder of the slider, and guide it around the pulley.
- Take one or several 1 g weights from the slider, and suspend them from the thread.
The accelerated mass is equal to the sum of the masses of the slider and the propelling mass.

6.3 Ancillary equipment*a) Time measurement between holding magnet and forked light barrier*

1 Forked light barrier	337 46
1 Multicore cable, 6-pole	501 16
1 Electronic stopclock P	313 033
or	
1 Digital counter	575 48
or	
1 Sensor-CASSY	524 010
1 Timer box	524 034
1 CASSY Lab	524 200
1 PC with Windows 95/ NT 4 or higher version	
or	
1 Pocket-CASSY	524 006
1 Timer S	524 074
1 Holding magnet adapter	33625
1 CASSY Lab	524 200
1 PC with Windows 98/ 2000 or higher version	

b) Time measurement between two forked light barriers

2 Forked light barriers	337 46
2 Multicore cable, 6-pole	501 161
1 Electronic stopclock P	313 033
or	
1 Digital counter	575 48
or	
1 Sensor CASSY	524 010
1 CASSY Display	524 020
1 Timer box	524 034
or	
1 Sensor CASSY	524 010
1 Timer box	524 034
1 CASSY Lab	524 200
1 PC with Windows 95/ NT 4 or higher version	
or	
1 Pocket-CASSY	524 006
1 Timer S	524 074
1 CASSY Lab	524 200
1 PC with Windows 98/ 2000 or higher version	

c) Measuring the black-out time with a forked light barrier

1 Forked light barrier	337 46
1 Multicore cable, 6-pole	501 161
1 Digital counter	575 48
or	
1 Sensor CASSY	524 010
1 CASSY Display	524 020
1 Timer box	524 034
or	
1 Sensor CASSY	524 010
1 Timer box	524 034
1 CASSY Lab	524 200
1 PC with Windows 95/ NT 4 or higher version	
or	
1 Pocket-CASSY	524 006
1 Timer S	524 074
1 CASSY Lab	524 200
1 PC with Windows 98/ 2000 or higher version	

d) Recording with VideoCom

1 VideoCom	337 47
1 Camera tripod	300 59
1 PC with Windows 95/ NT 4 or higher version	

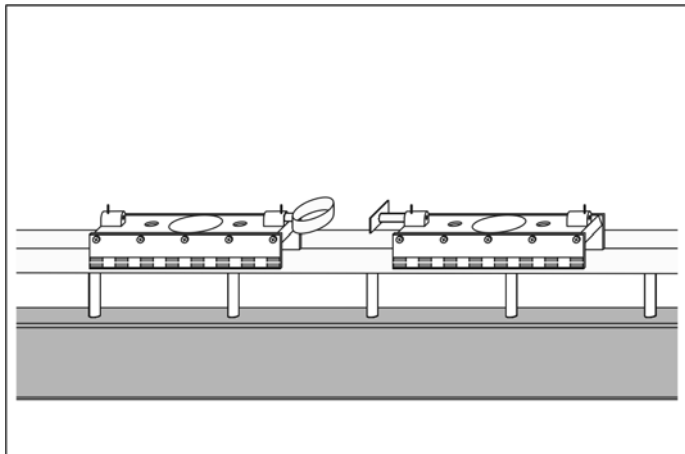
f) Recording with combination light barrier + combination spoked wheel (as motion sensing element) and CASSY

1 Combination light barrier	337 462
1 Timer S	524 074
1 Sensor-CASSY	524 010
1 CASSY Lab	524 200
1 PC with Windows 95/ NT 4 or higher version	

The combination spoked wheel (337 463) is already contained in the scope of supply of the linear air track.

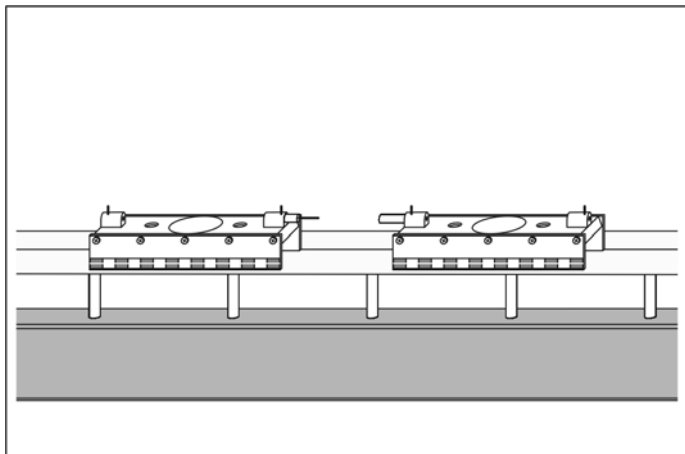
7 Collision experiments

7.1 Elastic collisions:



- Equip slider 1 with the impact spring and slider 2 with the impact plate.
Determining the masses of the sliders: see technical data.
- Equip both sliders with interrupters.

7.2 Inelastic collisions:



- Equip slider 1 with the needle and slider 2 with the tube. Fill the tube with plasticine.

7.3 Ancillary equipment:

a) Measurement with two forked light barriers

2 forked light barriers	337 46
2 multicore cable, 6-pole	501 16
1 digital counter	575 48

or

1 Sensor CASSY	524 010
1 Timer box	524 034
1 CASSY Lab	524 200
1 PC with Windows 95/ NT 4 or higher	

or

1 Pocket-CASSY	524 006
1 Timer S	524 074
1 CASSY Lab	524 200
1 PC with Windows 98/ 2000 or higher version	

b) Recording with VideoCom

1 VideoCom	337 47
1 Camera tripod	300 59
1 PC with Windows 95/ NT 4 or higher version	