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

4.2 Slider

4.3 Accessories
5 Putting into operation
5.1 High setup

additionally required:
1 air supply for air track  337 53
1 power controller  668 823
additionally recommended:
1 air stopper  337 52

- 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.

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.

5.2 Low setup
6 Uniform motion and uniformly accelerated motion

6.1 Newton’s first law (demonstrating inertia)

- 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.

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

additionally recommended:
1 scale 311 02

6.2 Uniformly accelerated motion

- Clamp the holding magnet.
- Equip a slider with the holding plate, interrupters and 1 g weights.
- Attach the holder for spoked wheel with combination spoked wheel.
- Attach the thread to the thread holder of the slider, 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.

additionally required:
1 stand rod, 25 cm 300 41

additionally recommended:
1 scale 311 02
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 16
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 16
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
- 2 multicore cable, 6-pole
- 1 digital counter

or
- 1 Sensor CASSY
- 1 Timer box
- 1 CASSY Lab
- 1 PC with Windows 95/NT 4 or higher

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

b) Recording with VideoCom
- 1 VideoCom
- 1 Camera tripod
- 1 PC with Windows 95/NT 4 or higher version