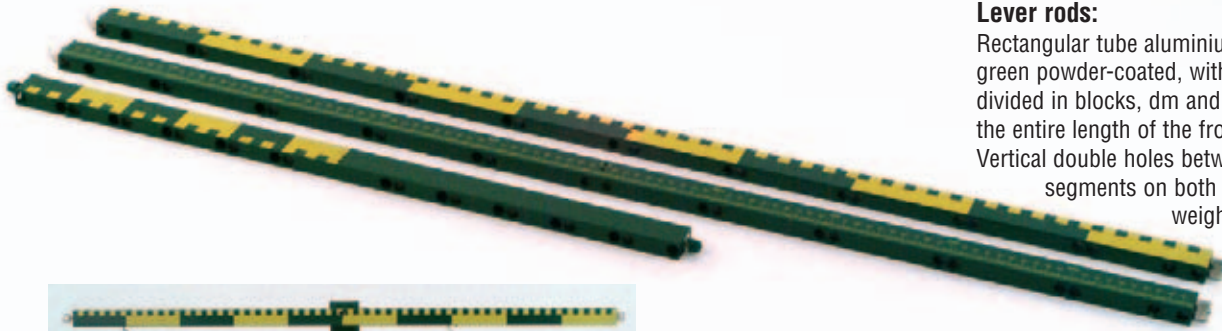




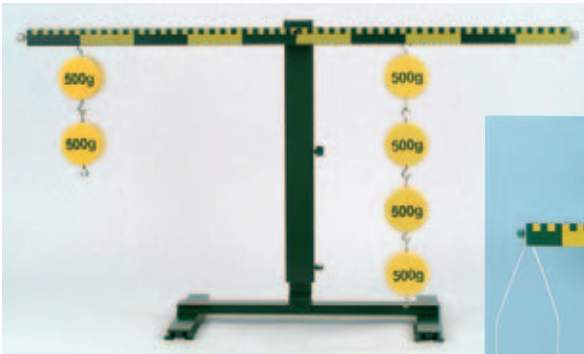
statics - lever



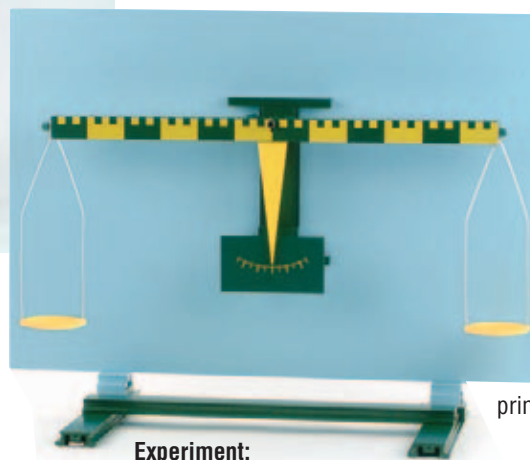
Lever rods:

Rectangular tube aluminium profile, 30x15 mm, green powder-coated, with easy-to-read scale divided in blocks, dm and cm graduations along the entire length of the front side of the rod.

Vertical double holes between yellow or green segments on both sides for suspending weights on hooks DM121-ff or holders for slotted weights DM120-ff or dynamometer; two horizontal holes in the middle for mounting the rod on a bearing pin or sliding saddle DS402-ff or the magnetic base DS102-3L to ensure stable or neutral balance; one metal taring screw at each end

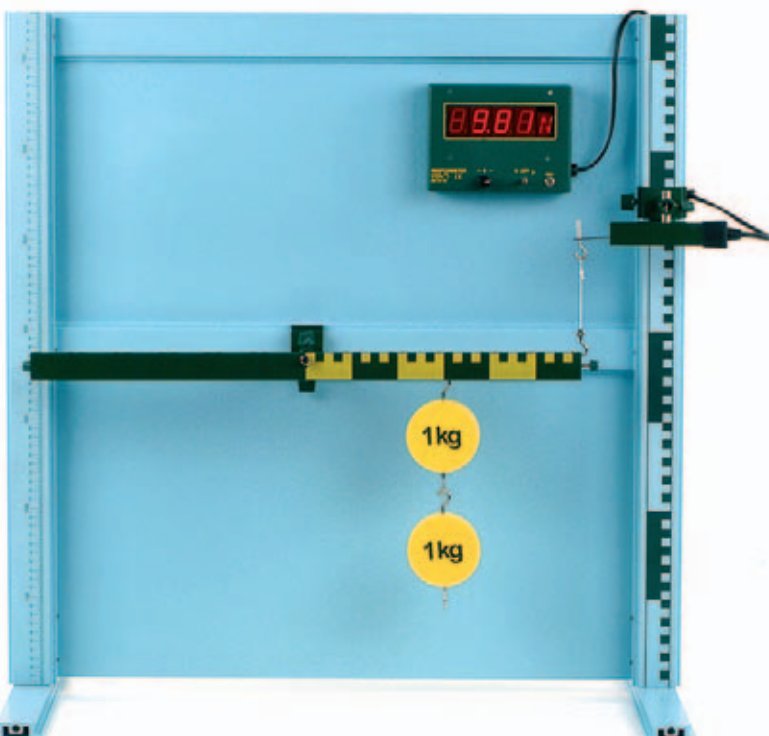


Experiment: Two-sided lever



Experiment:
Two-pan balance
(For list of required items see page 61)

Experiment: One-sided lever on assembly panel for clearly demonstrating how the one-sided lever works, only one half of the reverse side of the 600 mm lever rod is printed with a scale divided in blocks



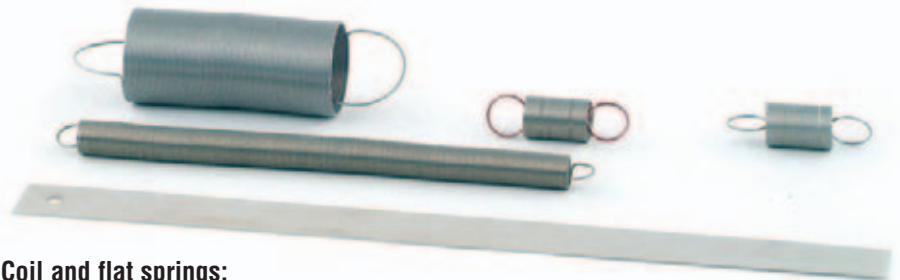
Recommended for mounting lever rods on

- Support rods:
DS402-1P Clamp on support with bearing pin, L=40 mm
- Stand rails:
DS403-3R Sliding saddle with bearing pin, H=34 mm
DS403-7R Sliding saddle with bearing pin, H=70 mm
- Magnetic panel:
DS102-2L Magnetic Base with bearing pin, D=100 mm

statics - coil springs



Experiment: Model of an angular hoist

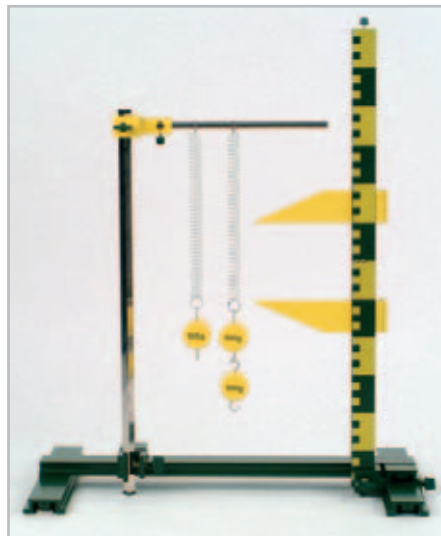


Coil and flat springs:

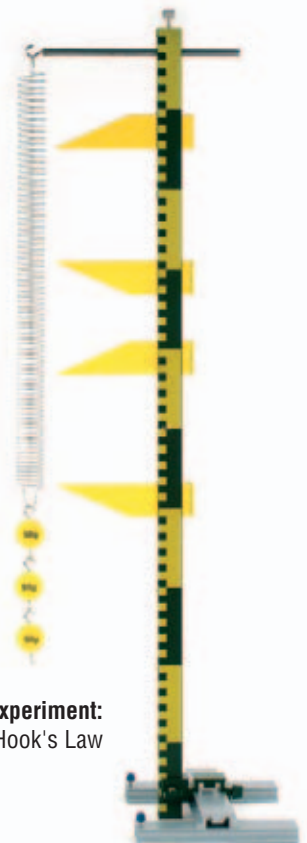
For experiments involving torsion and oscillation
 P1810-2A Coil spring 3 N/m, D= approx. 35 mm
 P1810-2B Coil spring 20 N/m, D= approx. 12 mm
 P1810-1S Coil spring 5 N/m, D= approx. 16 mm
 P1810-2S Coil spring 10 N/m, D= approx. 16 mm
 P1810-1D Flat spring, steel
 Dimensions: 300x25x0.5 mm



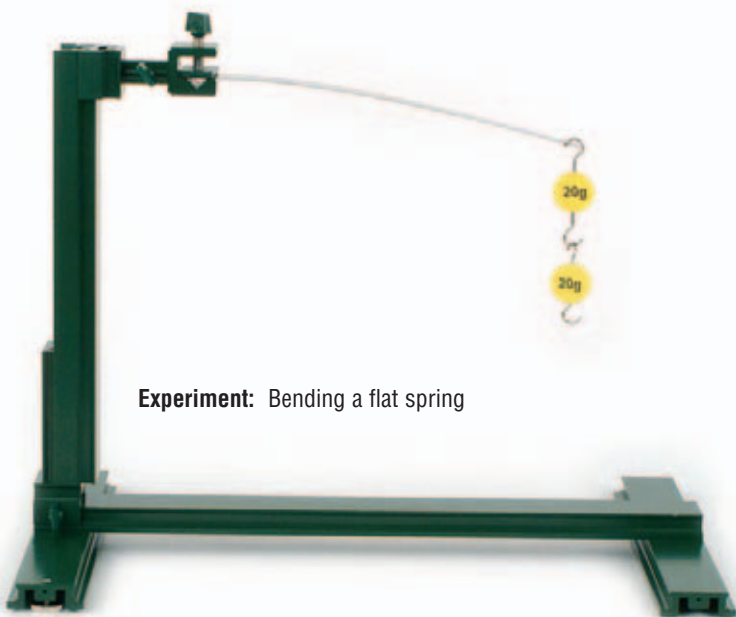
DG220-1K Bead chain, long
 L=850 mm, eyelets at each end
DM210-3A Pulley, plastic, D=100 mm
C1000-1C Glass beaker 150ml, short



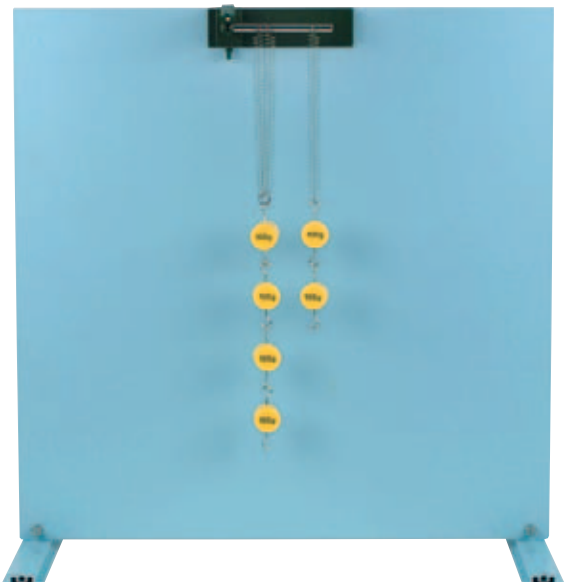
Experiment: Expanding two coil springs
 (5N and 10N)



Experiment:
 Hook's Law



Experiment: Bending a flat spring



Experiment:
 Proportionality
 of weight and
 mass



statics -force measurement



Precision dynamometer:

Spring dynamometer with newton scale, yellow-red scale halfway round divided in blocks as well as precise line scale, screw for setting to zero, guard against overexpansion of spring, in coloured metal case with hooks for hanging device and suspending weights Measuring accuracy: $\pm 0,5\%$ of the final reading; dynamometer case: L=180 mm

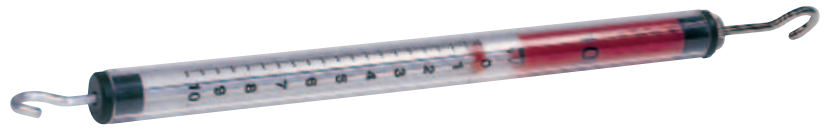
Dimensions: D=18 mm, total L= approx. 245 mm

- DM130-1A** Precision dynamometer 0,1 N, grey
- DM130-1B** Precision dynamometer 1,0 N, yellow
- DM130-1C** Precision dynamometer 2,5 N, red
- DM130-1D** Precision dynamometer 5,0 N, blue
- DM130-1E** Precision dynamometer 10 N, green
- DM130-1F** Precision dynamometer 100 N, black



Experiment:

Composite forces in the same direction (using the precision dynamometer)



Transparent dynamometer:

Spring dynamometer with Newton scale and zero-point correction, guard against overexpansion of the spring, the transparent case allows the working of the coil spring to be observed, with hooks for hanging the device and suspending weights Measuring accuracy: $\pm 2\%$

Dynamometer case: L=215 mm

Dimensions: D=16 mm, total L= approx. 285 mm

- P1130-1A** Dynamometer, 0.2 N, transparent, light yellow
- P1130-1B** Dynamometer, 1 N, transparent, light red
- P1130-1C** Dynamometer, 2 N, transparent, dark red
- P1130-1L** Dynamometer, 3 N, transparent, dark yellow
- P1130-1D** Dynamometer, 5 N, transparent, brown
- P1130-1E** Dynamometer, 10 N, transparent, dark green
- P1130-1F** Dynamometer, 20 N, transparent, orange
- P1130-1H** Dynamometer, 100 N, transparent, black

Description as above, yet with dimensions: D=20 mm, L=350 mm



DM135-1C

Plate for dynamometer

Acrylic plate painted yellow, for joining several dynamometers
Dimensions: 76x46 mm

P1130-2R Ring for parallelogram of forces

Wire ring for joining several dynamometers when demonstrating the parallelogram of forces
D=15 mm



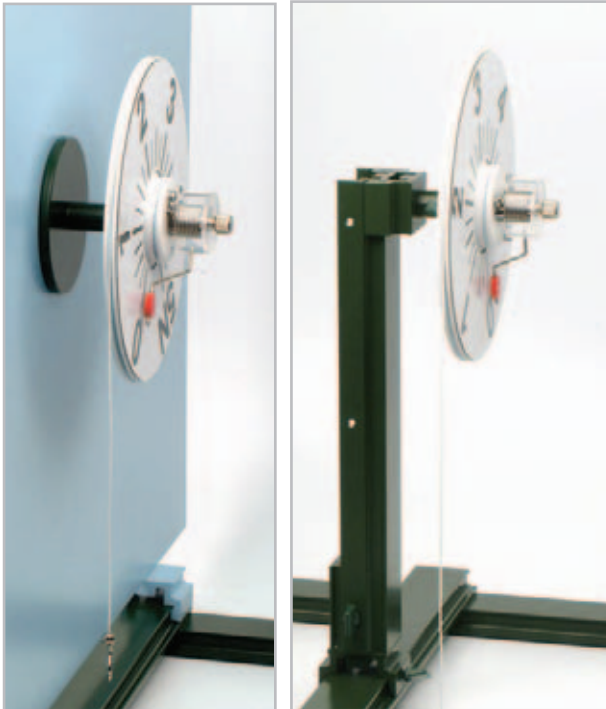
Experiment:

Composite forces in the same direction (using the torsion dynamometer)

statics -force measurement

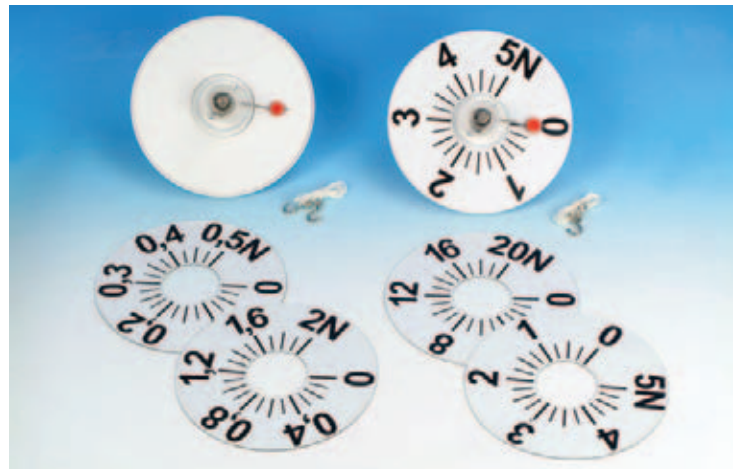


Mounting variations for the torsion dynamometer...



... magnetically on the assembly panel or ...

... on the rod.



Torsion dynamometer:

Torsion spring dynamometer with two replaceable, circular magnetic scales; mounted on support D=10 mm, L=45 mm, adjustable setting for correcting to zero, each scale with a string guide, string for suspending objects with hook. Measuring accuracy: $\pm 3\%$

Total D=200 mm

DM130-1T Torsion dynamometer 0.5 and 2 N

DM130-2T Torsion dynamometer 5 and 20 N

DM130-5R Additional circular scale 5 N, turns clockwise, magnetic



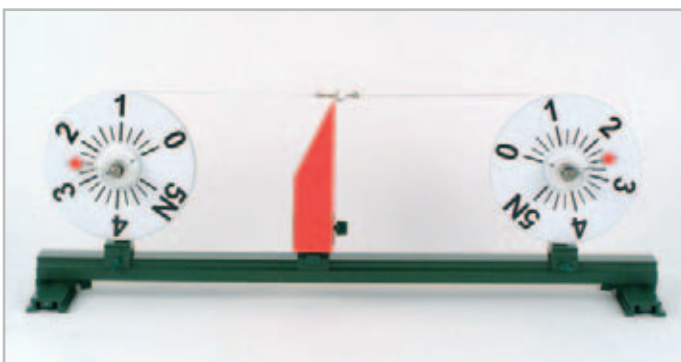
Assembly parts able to be used for mounting the torsion dynamometer DM130-ff

DS130-2H Support on sliding clamp for torsion dynamometer or

DS103-3G Sliding saddle H=34 mm or

DS103-7G Sliding saddle H=70 mm or

DS102-2K Magnetic base with clamp socket



Experiment: Force and opposing force, action equals reaction



Experiment: Parallelogram of forces, magnetically mounted on assembly panel



statics -force measurement



DM722-1N Newtonmeter „inno“ 20N/2000g

Featuring force measurement over a minimum of distance, yet with a high degree of precision, and a 26 mm digital display, making this device especially "simple, easy and safe" to use

Demonstration instrument with magnetic holder for measuring force (in newtons) or mass (in grams). The easy-to-read LED display (H=26 mm) and the external sensor in a rugged case of rectangular tubing make it an ideal instrument for mechanics experiments, particularly when used with a magnetic panel. Both tension and pressure can be measured. By means of a support rod (D=10 mm) the sensor can be fastened to common stands.

Technical data:

Measuring range "N": ±20 N, resolution: 0.001 N

Measuring range "g": 0...2000g, resolution: 0.1 g

Zero compensation (tare): manual, by means of adjustment knob

Accuracy: better than 0.5 %

Power supply: 4 x 1.5 V mignon cells (included) or external power supply 6 V/500 mA, P3120-6N

Dimensions: approx. 160x120 mm



DM723-1N Milli-Newtonmeter „inno“ 200mN/20g

For description and technical data see newtonmeter "inno" DM722-1N, except

Measuring range: ±200 mN, 0...20g

Recommended accessories:

P3120-6N

Mains transformer
6V/500 mA

P3120-5B

S-shaped assembly platform



DM727-1B

Newtonmeter „handy“

Hand multimeter for measuring tension and pressure as well as weight; tare compensation switch, peak-hold function, switch for selecting positive or negative display mode, sensor unit mounted on case with several accessories for a variety of measurements

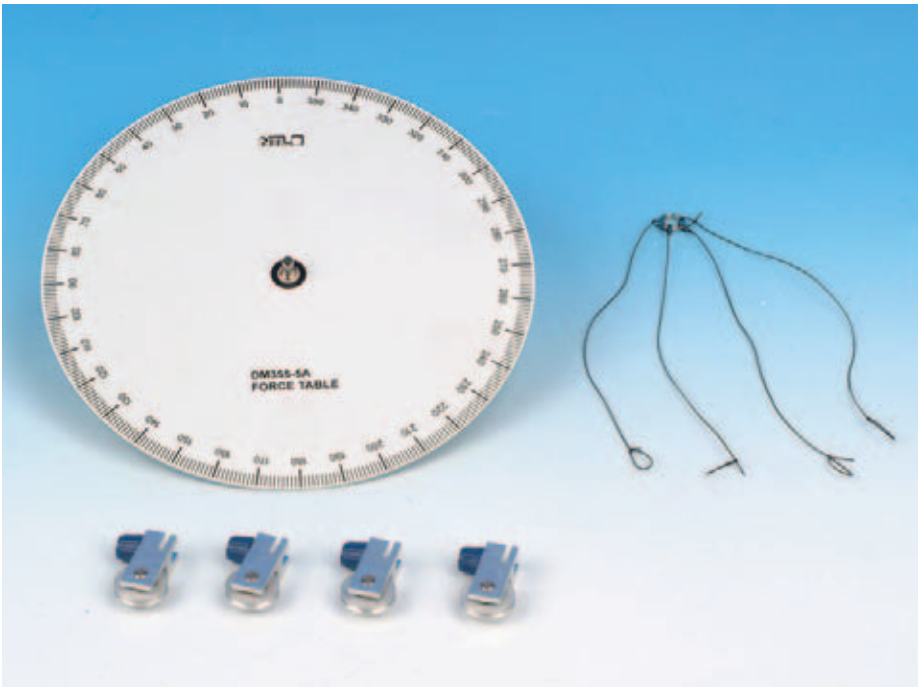
Measuring range: 20 kg / Newton / LB

5-digit LC display

Dimensions: 227x83x39 mm



statics -force measurement

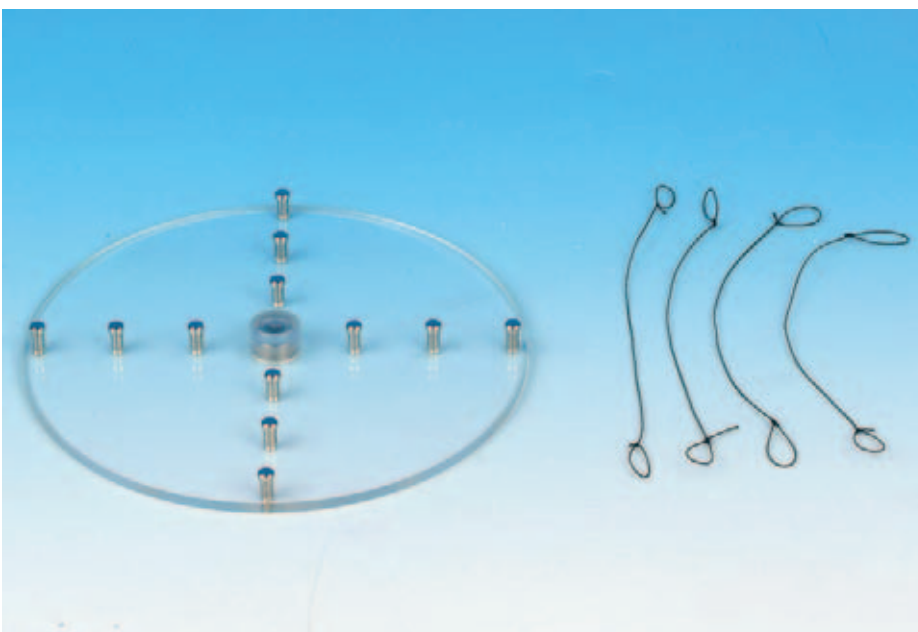


DM355-5A Force table

For quantitatively demonstrating the resolution of forces.
 Metal working disk, $D=200$ mm, painted white, with precise graduations. Using a support rod fastened through the centre hole ($D=10$ mm), the table is mounted on available support material (see setup of experiments). Up to 4 guide pulleys can be fastened to the edge at any angle. Weights (not included) can then be suspended from strings run along the pulleys.



Experiment:
 Resolution of forces using the force table



DM355-5M Torque accessory for force table For experiments with torque
 Acrylic disk, $D=160$ mm, with centre axis on ball bearings for mounting on the force table; 4 lines of 3 metal screws each at 90° to each other, 25, 50 and 75 mm from the centre point, for fastening the strings (included) running over the pulleys deflecting force over the edge of the force table



Experiment:
 Determining torque at more than one point



statics - inclined plane



DS107-3G Inclined plane, complete

Compact model consisting of the following parts:

DS107-1S 1x Inclined plane

Two aluminium track profiles able to be inclined at a desired angle to each other, with printed scale divided in blocks, Length = 600 mm

DS102-2F 2x Sliding saddle on rail base

For ensuring stability

DS102-2G 1x Clamp saddle

Allows infinitely variable setting of inclination

DS107-1G 1x Degree scale on saddle, vertical

For easily reading off the angle of inclination, even at a distance; dimensions: 330x60 mm

DS107-1K 1x Holder for dynamometer

For fastening dynamometer DM130-ff or P1130-ff

Accessories required:

DM650-1R Roller

Steel cylinder, $D=40$ mm, with two hooks and acrylic wheels, $D=67$ mm, for use as a rolling weight on the inclined plane, weight: 500 g

DM300-2A Dynamics trolley, demo, 50 g

Trolley body and wheels of ABS plastic, runs with very little friction, 4 mm holes at the ends for attaching devices with 4 mm plugs, 2 mm hole for attaching string with plug DM310-2S, two holes on the side for fastening weights DM325ff, one centred, tapped hole for screwing in turret DM300-1T

Dimensions of trolley body: 120x66 mm, weight: 50 g



DM310-2S String with plug for trolley

2 mm plug with string; string length: approx. 110 cm

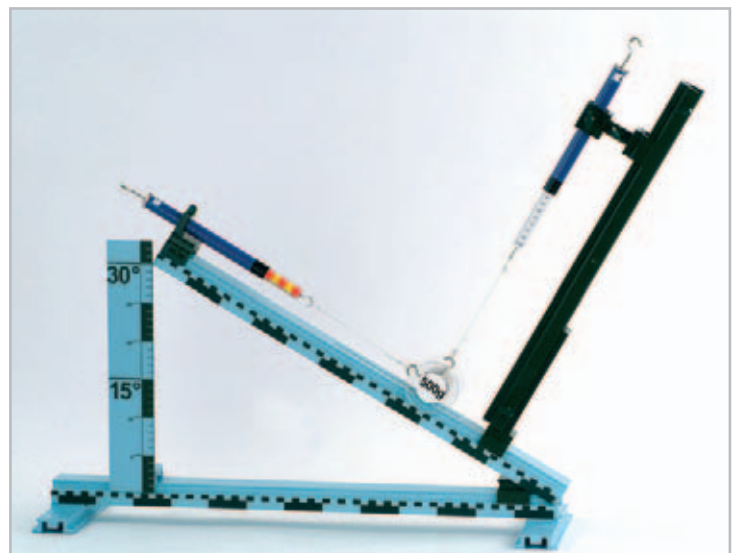
Additional weights for dynamics trolley DM300-2A:

DM325-50 Additional weight 50 g

DM325-01 Additional weight 100 g



Experiment: Downward force on incline
Using torsion dynamometer DM130-2T and holder DS130-2H



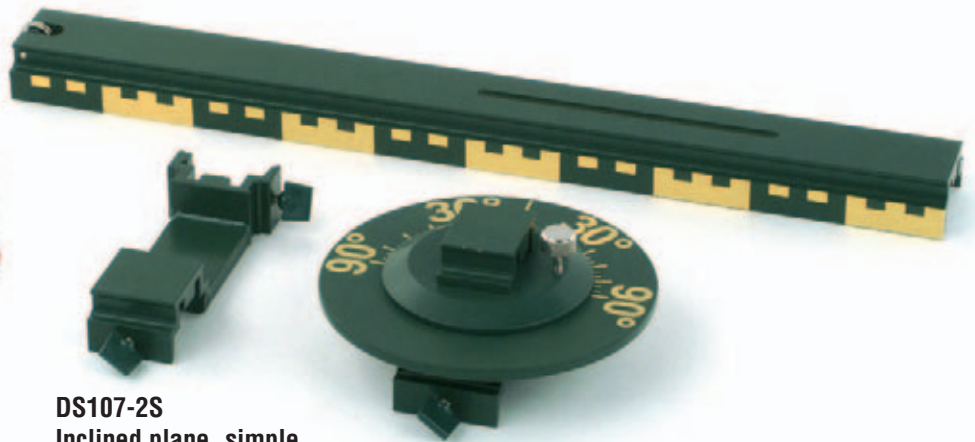
Experiment: Force components on an inclined plane

statics - inclined plane



Experiment:

Downward force on incline
Using Newton meter "inno" DM722-1N



DS107-2S

Inclined plane, simple

Universal track with slot, made of special aluminium profile, L=600 mm, green powder-coated with printed segments in yellow, a permanently mounted deflection pulley at the left end of the track, one knurled screw positioned at the centre of the side for fastening the track to a clamp saddle DS102-2G

DS105-4G Track holder, fixed

DS107-3D Track holder, rotatable, with degree scale

For holding and rotating support rails by means of rail support stand DS103-ff and clamp saddle DS102-2G; aluminium disk attached to saddle made from special profile, with clamping screw for mounting on rail support stands DS103-ff using clamp saddle DS102-2G, on vertically arranged support rails or on the assembly panel DS602-2A D=160 mm, green powder-coated, printed with degree scale in yellow
Scale: 0° to 90°, left and right, in 5° graduations



DM650-1R Roller

Steel cylinder, D=40 mm, with two hooks and acrylic wheels, D=67 mm, for use as a rolling weight on the inclined plane
Weight: 500 g

P1220-1R Roller, small "compact"

Steel cylinder (D=30 mm) with runner and centre hole for use as a weight on lever rod DM221-ff when used as an inclined plane
Weight: 200 g

P1220-2R Handle, set of 2

For attaching dynamometer to small roller P1220-1R when lever rod DM221-6H is used as an inclined plane

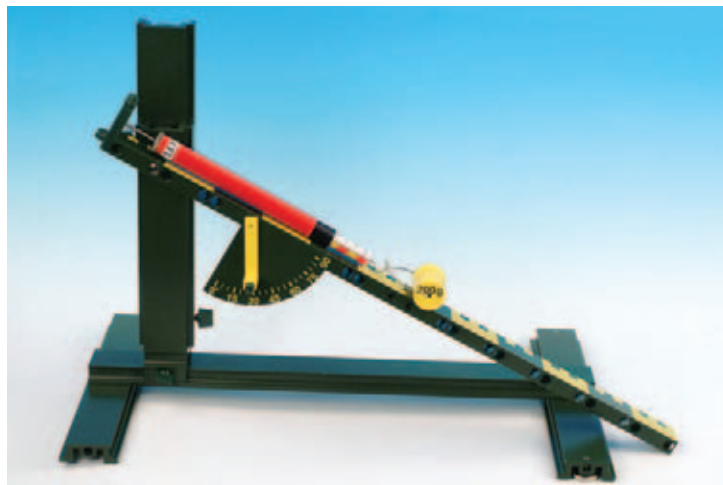


P1225-1S Scale 90°, "compact"

Metal scale 0...90°, r=80mm; support: 10x35 mm, with bearing axle and fixing bolt for fastening to lever rod DM221-6H

P1225-1Z Pointer, "compact"

Plastic pointer on support, painted, for insertion into the support of cs scale P1225-1S (rotatable), may be used as inclinometer, with holder for glass tubes max. 8mm in diameter
Dimensions: 70x12x32 mm



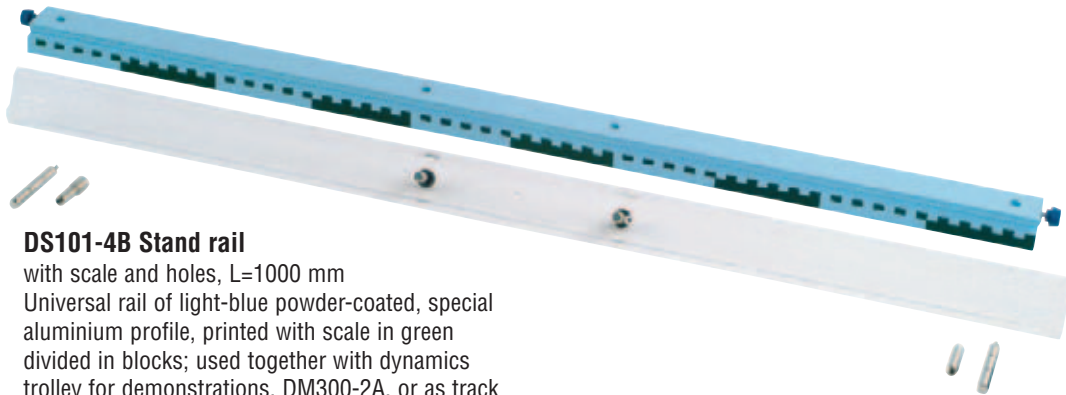
Experiment:

Downward force on incline

Use of lever metal DM221-6H as inclined plane



statics - friction



DS101-4B Stand rail

with scale and holes, L=1000 mm

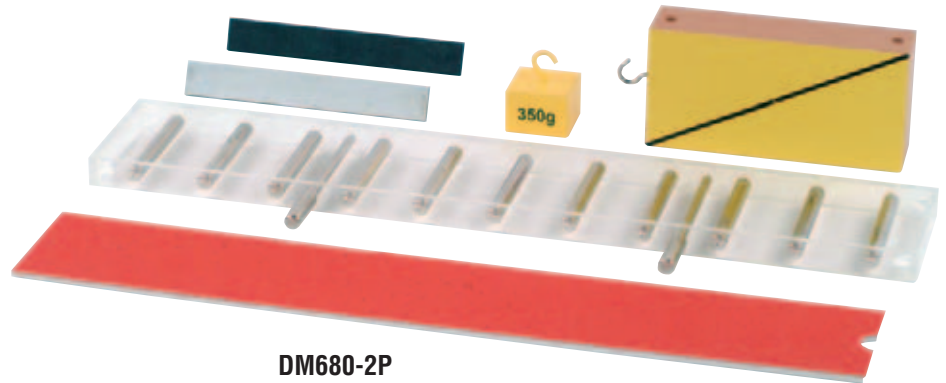
Universal rail of light-blue powder-coated, special aluminium profile, printed with scale in green divided in blocks; used together with dynamics trolley for demonstrations, DM300-2A, or as track for balls 60 mm in diameter, DM360-ff; four vertical holes for inserting and fixing the supports DS101-3A for the flexible track, acrylic, L=1000 mm, DS101-2A

DS101-2A Flexible track, acrylic

For use in experiments on non-uniform motion, conversion of "potential to kinetic energy" and "up- and downhill motion" of a trolley or ball. Flexible acrylic panel, 54 mm in width, with longitudinal grooves for dynamics trolley for demonstrations, DM300-2A, or balls 60 mm in diameter, DM360-ff

DS101-3A Supports for fastening flexible track, set of 2

Two rods with engraved graduations for infinitely variable adjustment of the angle of inclination of the ends of the flexible acrylic track, DS101-2A, on the stand rail with scale and holes, DS101-4B
Dimensions: D=10 mm, L=110 mm



DM680-2P

Static, sliding and rolling friction board

Acrylic frame on two supports with eleven virtually friction-free steel rollers on bearings and an additional panel with smooth and rough surfaces

Dimensions: 500x90 mm

DM680-2R Block for friction and stability

Varnished wooden block with hook; at one end a hook for attaching a dynamometer when doing experiments on static, sliding or rolling friction; a centre hole for a bearing pin for attaching plumb line DM600-1L when doing experiments on stability; two 4 mm holes for attaching either rubber or sliding pad with plug DM680-ff

Dimensions: 160x80x40 mm; weight: approx. 350 g

DM680-3R Weight, 350 g, with hook

For doubling the mass of friction and stability weight DM680-2R used for experiments with static, sliding and rolling friction

Material: Fe, yellow powder-coated

Dimensions: 40x40x28 mm

DM680-2G Rubber pad with plug

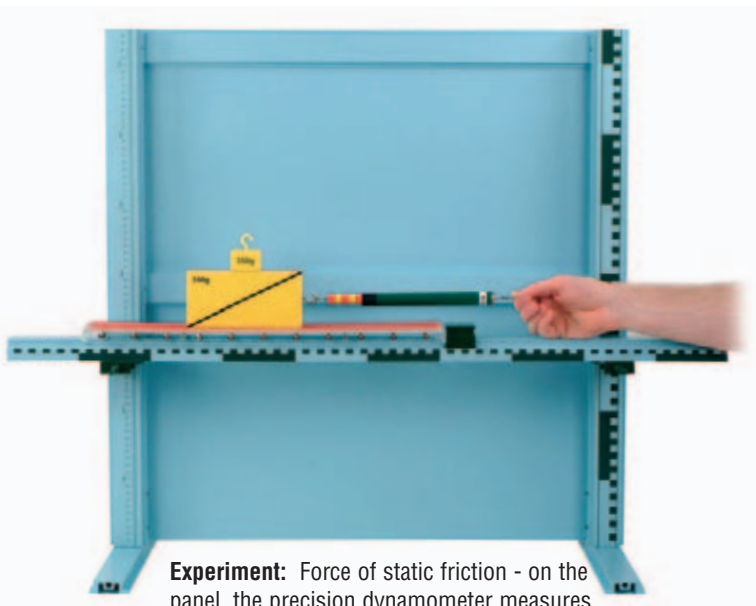
Pad that can be attached to friction and stability block DM680-2R; used together with flexible track, acrylic, L=1000 mm, DS101-2A, for experiments in static friction

Dimensions: 160x22x4 mm

DM680-3G Sliding pad with plug

Plastic pad that can be attached to friction and stability block DM680-2R; used together with flexible track, acrylic, L=1000 mm, DS101-2A, for experiments in sliding friction

Dimensions: 160x22x4 mm



Experiment: Force of static friction - on the panel, the precision dynamometer measures the force of friction

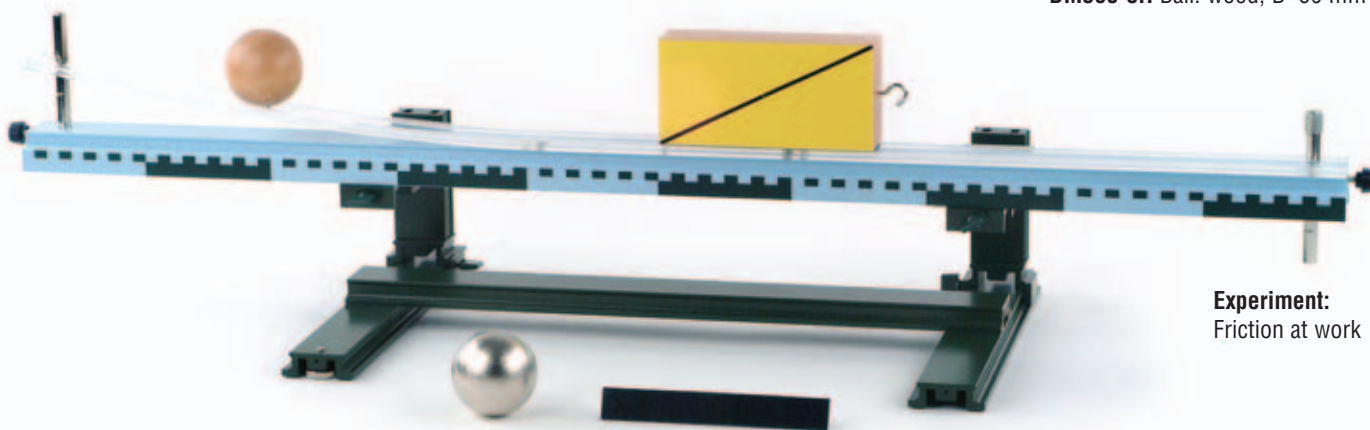
statics - friction



Experiment: Force of static friction - on the stand, the Newton meter "inno" measures the force of friction



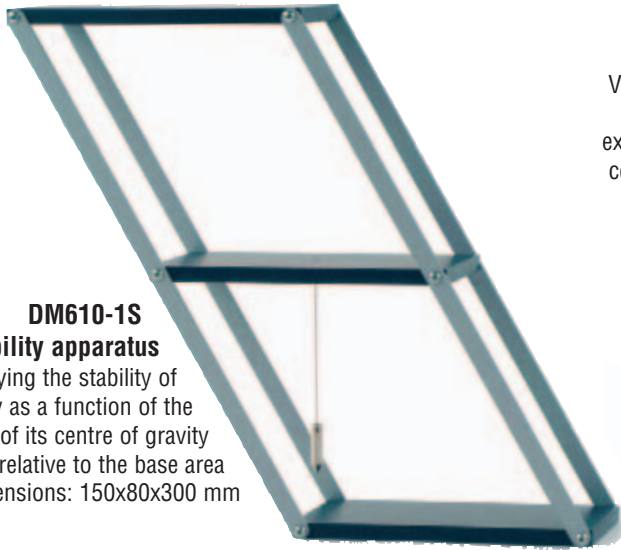
DM360-5E Ball: steel; D=60 mm
DM360-5H Ball: wood; D=60 mm



Experiment:
Friction at work



statics - centre of gravity



DM610-1S
Stability apparatus
 For studying the stability of a body as a function of the position of its centre of gravity relative to the base area
 Dimensions: 150x80x300 mm

DM680-2R
Block for friction and stability
 Varnished wooden block with hook; at one end a hook for attaching a dynamometer when doing experiments on static, sliding or rolling friction; a centre hole for a bearing pin for attaching plumb line DM600-1L when doing experiments on stability; two 4 mm holes for attaching either rubber or sliding pad with plug DM680-ff
 Dimensions: 160x80x40 mm;
 Weight: approx. 350 g



P7230-4E Bearing pin



Experiment:
 Stability

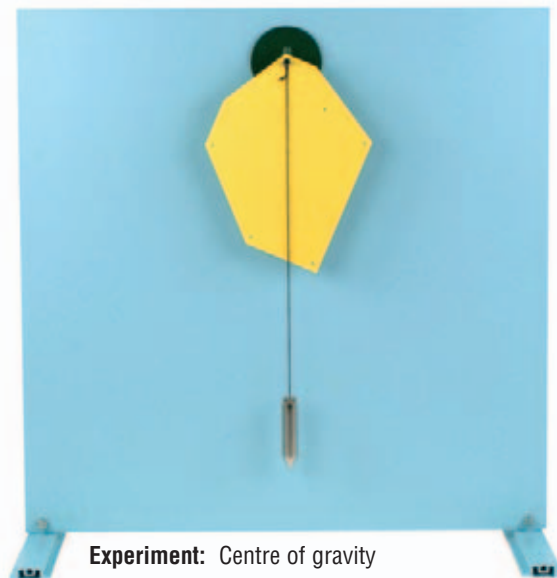


DM630-1S
"Balance artist"
 For demonstrating varieties of balance
 Plastic hemisphere (D=80 mm) mounted on a rod (10x135 mm) with a sliding weight and knurled adjustment screw



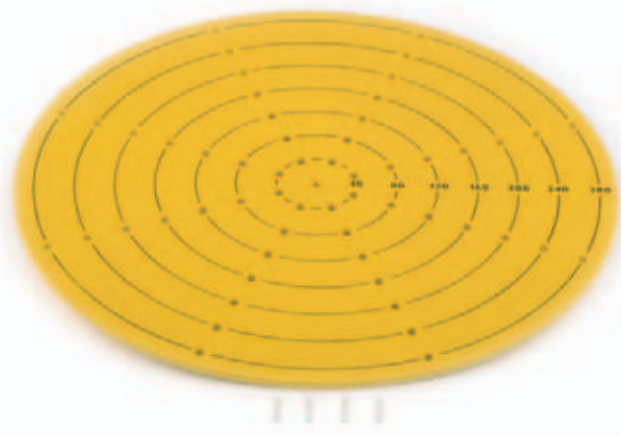
DM620-1S **Plate for testing centre of gravity**
 Irregularly shaped plastic plate, with holes; for introducing the concept of centre of gravity
 Dimensions: approx. 310x235x4 mm

DM600-1L Plumb line
 Pointed metal cylinder, L= approx. 100 mm



Experiment: Centre of gravity

statics - centre of gravity



DM355-1M Inertia wheel

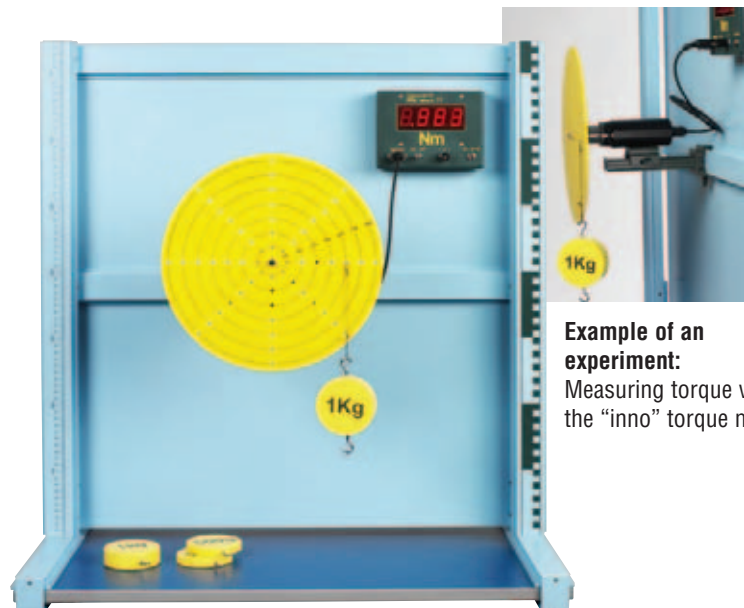
Plastic wheel for studying torque equilibrium; centre hole for bearing pin of the sliding saddle DS402-ff, clamp on support with bearing pin, L=40 mm, DS402-1P or magnetic base DS102-3L; holes along concentric circles for fastening pins; very low weight; fastening pins, set of 4 (DM355-2M) included
Diameter: 300 mm

Experiment: Torque equilibrium



DM725-1D Torque meter, "inno"

Magnetic demo instrument for measuring torque using sensor DM725-1S (not included);
3 1/2-digit, 26-mm LED display;
+/-1.45, 0.001 Nm measuring range; +/- 2% accuracy;
knob for manual resetting; DIN jack for connecting the torque sensor; On-Off switch
Power supply: 4 x 1.5 V mignon cells (included) or external power supply 6 V/500 mA, P3120-6N
Dimensions: approx. 160x120x45 mm



Example of an experiment:
Measuring torque with the "inno" torque meter



DM355-9M Inertia wheel spindle

Metal spindle, 40x10 mm, for stably connecting inertia wheel DM355-1M

DM725-1S Torque sensor

Highly durable torque sensor; includes a chuck for accommodating rods and bolts up to 13 mm in diameter; metal case with an NTL rail profile; may be connected to "handy" torsion apparatus DM137-1T, "inno" torque meter DM725-1D and torque converter DM132-1K

See page 162 for additional torque measuring devices.

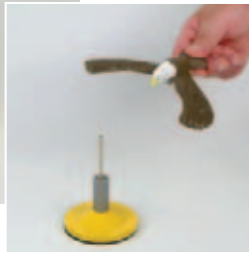




statics - centre of gravity



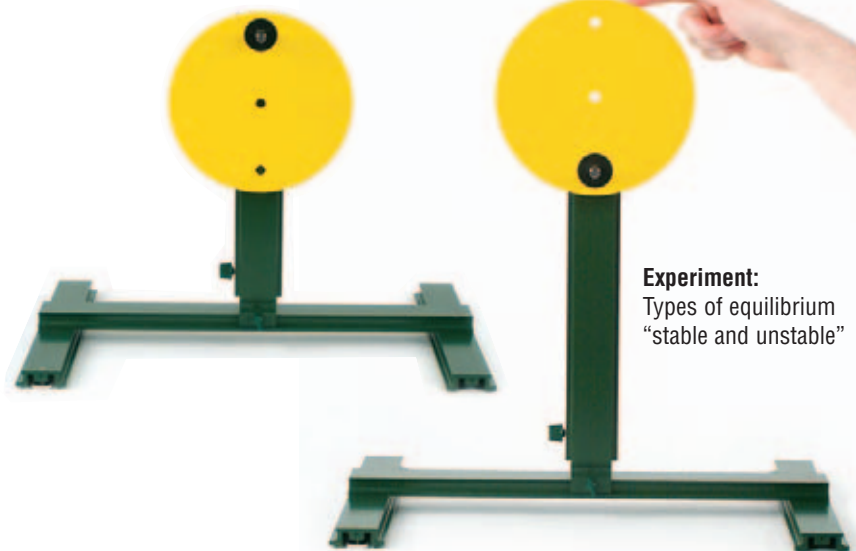
DM637-1A Hovering eagle
Plastic eagle, wingspan approx. 170 mm, centre of gravity at the tip of the beak; "floats" on a fingertip, any edge or on the branch section supplied



DM635-1S Floating hammer
Hammer with curved metal arc; for demonstrating equilibrium
Dimensions of hammer: approx. 18x67 mm



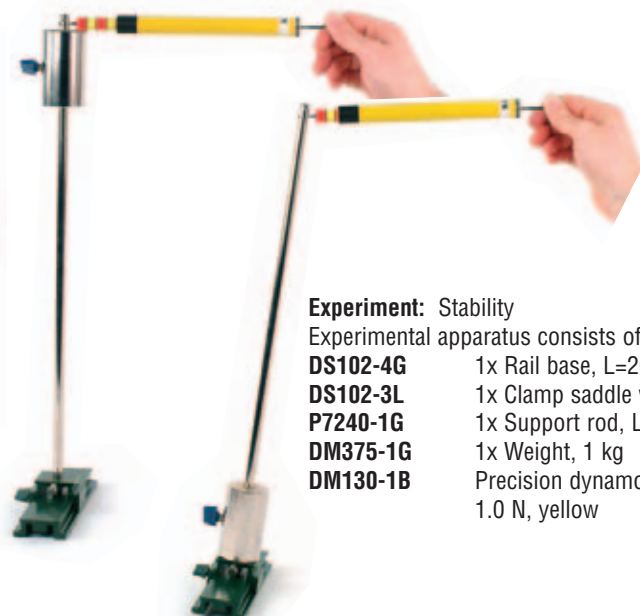
DM620-1K Equilibrium wheel
Plastic wheel for demonstrating stable, unstable and indifferent equilibrium
Three holes for mounting the wheel on support rods with a maximum diameter of 10 mm;
Wheel diameter: 200 mm



Experiment:
Types of equilibrium
"stable and unstable"



DM600-1W Bubble level, set
consisting of:
1 Bubble level, L=235 mm
1 String level, L=73 mm
1 Circular level, D=40 mm
1 Inclinometer (protractor)
Individual units in black plastic cases



Experiment: Stability
Experimental apparatus consists of:
DS102-4G 1x Rail base, L=200 mm
DS102-3L 1x Clamp saddle with hole
P7240-1G 1x Support rod, L=500 mm
DM375-1G 1x Weight, 1 kg
DM130-1B Precision dynamometer 1.0 N, yellow