

simple - fast - safe



the world of experiments

ntl compact system

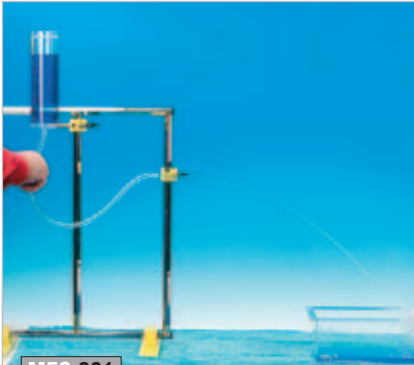


introduction
mechanics
thermodynamics
experiment topics

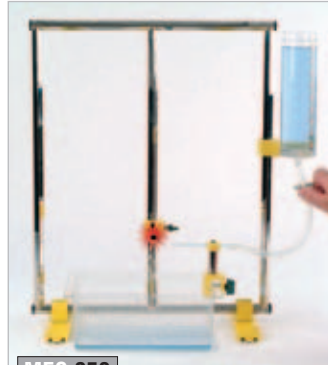




compact system advantages mechanics & thermodynamics



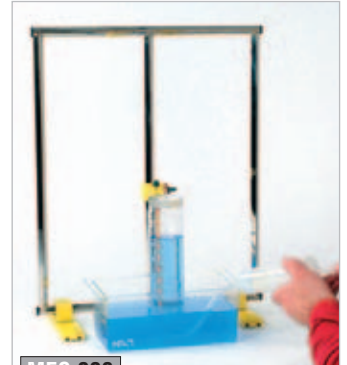
MEC 061



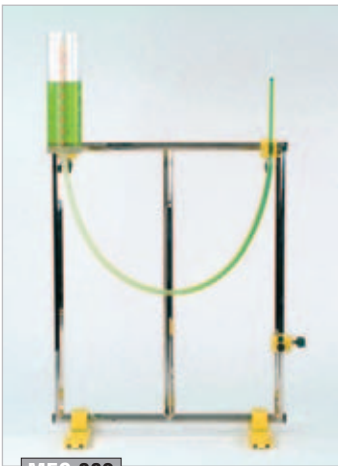
MEC 059



MEC 007



MEC 006



MEC 062

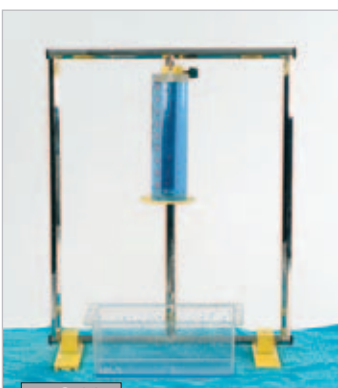


MEC 063



P1412-1A 500 ml drainage beaker on support

- Classroom time is precious, especially when doing student experiments, and should not be wasted on secondary activities such as setting up apparatus.
- No need for time-consuming experiment set-ups.
- Simply structured apparatus thanks to compact, square-rod support rails.
- Only a few steps required to obtain a stable, safe apparatus assembly, saving much time. Thanks to square profiles and clamps, little adjustment required before beginning.
- Square clamps with bearing pins allow pulleys, coils springs, tubes and other devices to be mounted quickly and easily.
- Support stand may be extended to over one metre simply by adding a square rod and clamping sleeve. Stable assembly, important especially for the second pendulum, experiments in freefall acceleration etc.



MEC 065



MEC 065



MEC 068

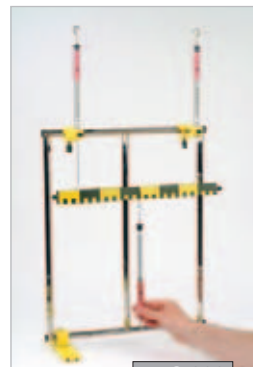
compact system advantages mechanics & thermodynamics



MEC 008



MEC 020



MEC 022



MEC 026

the ntl compact system is multi-functional



MEC 021

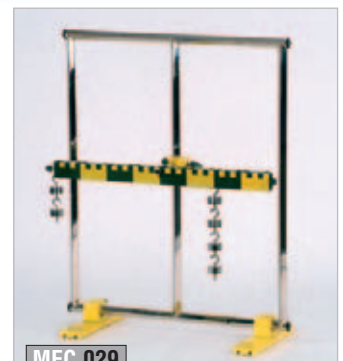
complete
list of experiment
titles see pages
210 to 213

discharge beaker

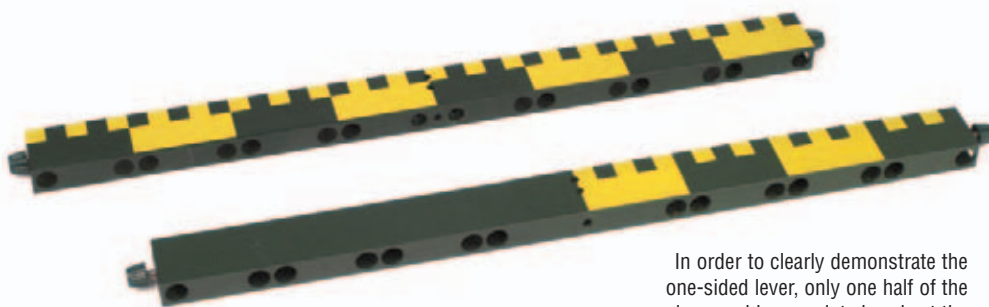
discharge beaker
graduated cylinder
air bell
vacuum chamber
bubble burster

lever rod

measuring stick
balancing beam
inclined plane



MEC 029



P1220-1H Lever rod, L = 40 cm

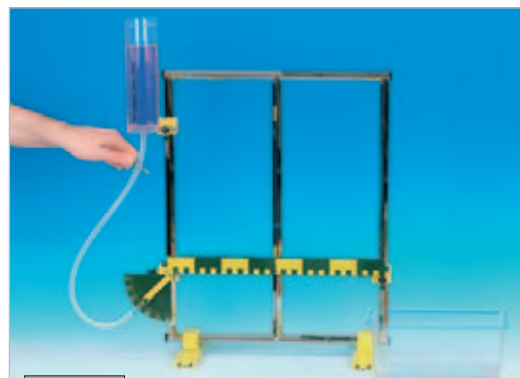
In order to clearly demonstrate the one-sided lever, only one half of the lever rod has a printed scale at the reverse side.



MEC 030



MEC 053



MEC 040



MEC 027



compact system mechanics



DM990-M1 Mechanics 1 “compact system” consisting of:

P1100-2B	1 Vernier callipers, plastic	P1810-1S	2 Coil springs, 5 N/m, D= approx. 16 mm
P1100-1S	1 Measuring tape on support, 3 m	P1810-2S	1 Coil spring 10 N/m, D= approx. 16 mm
P1220-1H	1 Lever rod, L = 40 cm	P1810-1C	1 Flat spring, steel, 0.4 mm, L=165 mm
P1220-2D	2 Scale pans with handle	P1120-3E	1 Hollow block (Archimedes)
P1220-1Z	1 Pointer for lever rod	P1120-3B	1 Iron block
P1220-1K	1 Scale, small, on support	P1810-3B	1 Elastic string, white, L=1 m
P1120-1G	1 Weights on hook, 50 g, set of 6	P7100-2F	1 Cord for block and tackle, L=3 m
P1120-1B	1 Balance weights set, 1-50g	DM210-2A	4 Pulleys, ABS, yellow, D=75 mm
P1120-1S	1 Lead (tare) weights 50 g	P1230-2R	1 Bracket for pulleys, D=75 mm
P1220-1R	1 Roller, “compact”	P1120-1U	1 U-tube, glass, L=250 mm
P1220-2R	1 Roller handles, set of 2	P1410-1L	1 Balloons, small, set of 2
P1225-1S	1 Degree scale, 90°, “compact”	P7400-2C	1 Beaker, plastic, 100 ml
P1225-1Z	1 Suspended pointer, “compact”	P7405-2S	1 Test tube, 160/16 mm, graduated
P1220-1F	1 Holder for dynamometers, “compact”	P7813-M1	1 Box insert M1 cs
P1130-1C	2 Dynamometers, 2 N, transparent, dark red	P7806-1B	1 Storage box, large



DM990-Z1 Mechanics & thermodynamics "compact system" accessories

Accessories required for DM990-M1 and DT990-T1

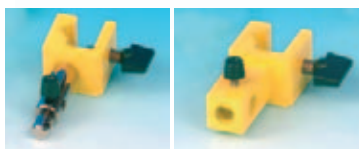
consisting of:

P7211-1S

Support frame, complete, consisting of:

- P7211-1R 1 Square-tube frame, 400 x 500 mm
- P7211-2F 2 Frame bases
- P7241-1S 1 Square support rod with clamping screw, L=500 mm

- P7230-2L 2 Clamps on support with bearing pin
- P7230-2M 1 Square clamp
- P1120-3D 1 Iron block, small
- P1120-3A 1 Aluminium block
- P7251-4T 1 Tube holder on support
- P7251-2T 1 Tube holder
- C6100-2K 1 Syringe, 20 ml, plastic
- P7030-2A 1 Petroleum, scented, 50 ml
- P7050-1A 1 Powder dye, red
- C7445-7S 1 Silicon hose
- P7502-1A 1 Scissors SE
- P7400-4A 1 Graduated cylinder, 100 ml, plastic
- C7447-1B 1 Plastic pan, 262x162x100 mm



Recommended accessory:
Overflow beaker
250 ml



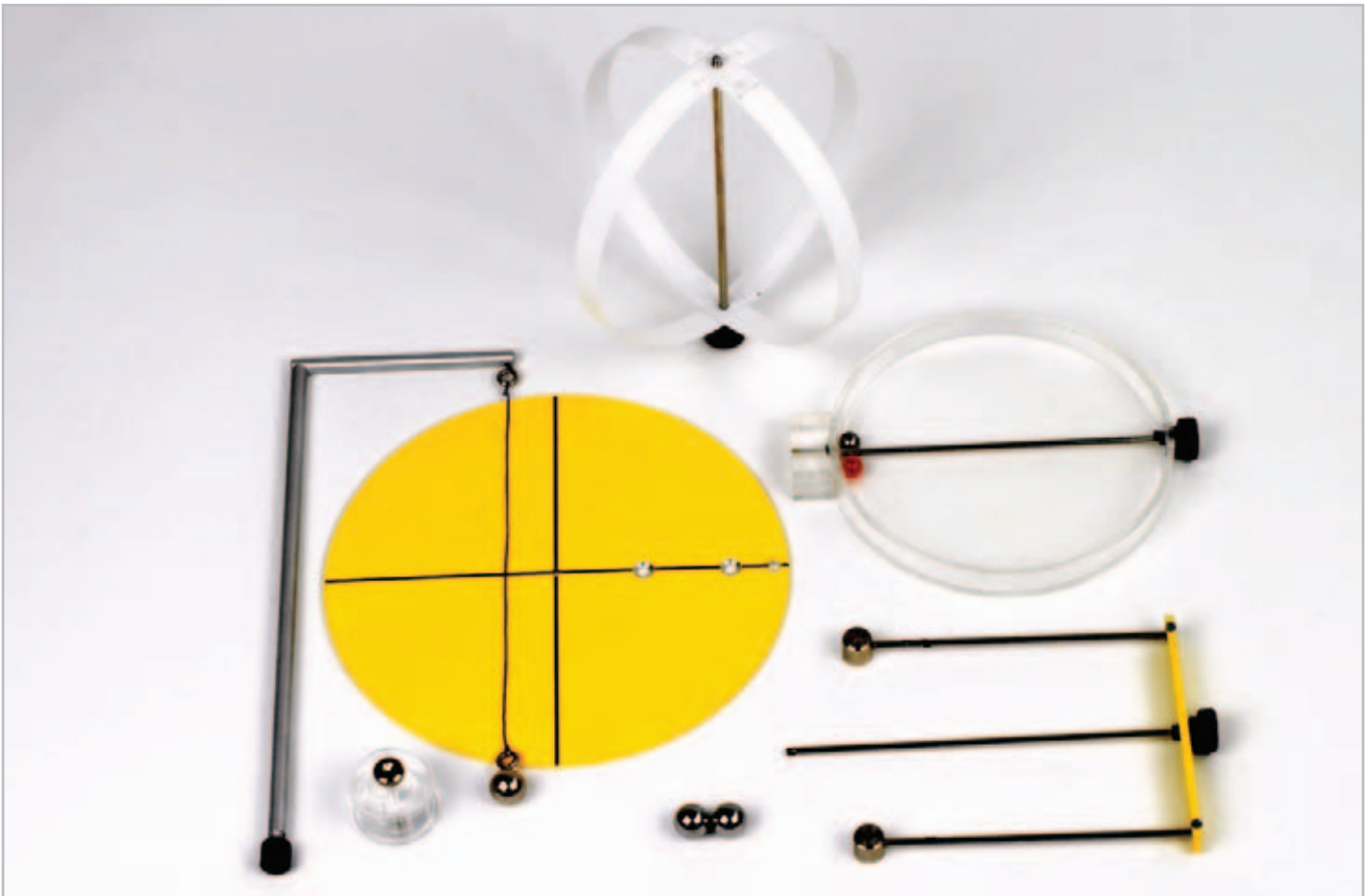
compact system mechanics



DM990-M2 Mechanics 2 “compact system”, supplementary set to DM990-M1, consisting of:

P1130-1E	1	Dynamometer, 10 N, transparent	P1412-2B	1	Rubber rings, wide, set of 2
P1130-2R	1	Ring for parallelogram of forces	C6100-2B	1	Syringe, 150 ml, plastic
P1230-1L	1	Pulley with pin, D=50 mm	P1411-1F	1	Immersion probe, curved, with stopper, SE
P1230-2L	1	Pulley with holes, D=100 mm	C6030-1C	1	Pointed glass tube, L=110 mm
P3410-5A	1	Drive belt, “compact”	P1412-1W	1	Waterwheel, small
DM211-20	1	Gear with 20 teeth, red, D=44 mm	C7416-1A	1	Pinchcock, Mohr, large
DM211-40	1	Gear with 40 teeth, yellow, D=84 mm	P1412-2D	1	Round lid, acrylic, D=65 mm
P1412-2S	1	Plate for testing centre of gravity, small	C6030-2B	1	Glass tube, right-angled, pointed
P1412-1A	1	Drainage beaker on support, 500 ml	P7422-9A	1	Capillary tube, set of 3
C7320-8A	1	Rubber stopper, 50/60/45 mm	P7813-M2	1	Box insert M2 cs
P1412-1C	1	Cartesian diver, small	P7806-1B	1	Storage box, large
P1412-3K	1	Plastic foil, set of 3			

compact system mechanics



DM990-M3 Mechanics 3 “compact system” for rotational motion, consisting of:

P1340-2E	1	Centrifugal hoops, “compact”
P1340-2Z	1	Watt's governor, “compact”
P1340-2R	1	Foucault's pendulum, “compact”
P1340-2D	1	Rotating disk, “compact”
P3410-5S	1	Spacer disc
P3711-1F	1	Fixing screw, M3, short
P1340-2S	1	Steel balls 1/2" (12.7 mm), set of 2
P1340-2K	1	Rotational dynamics paradox / accelerometer, “compact”
P7813-M3	1	Box insert M3 cs
P7806-1A	1	Storage box, small

Required accessory:

MB402-4H Momentum apparatus, “compact”, powered by hand

See also electricity compact system

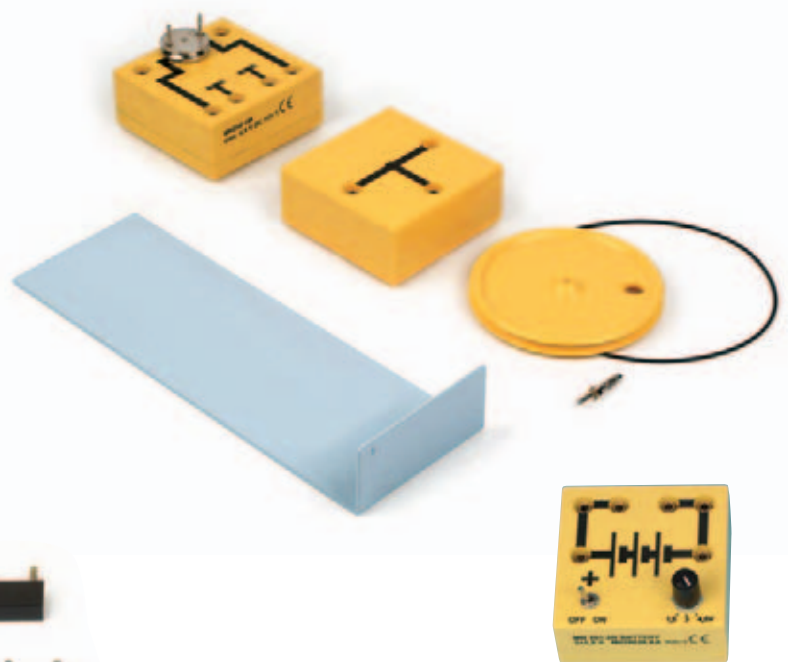
Consisting of:

MB200-1M	1	MBC Motor
P3710-1T	1	MBC lead, t-shaped
P3410-3L	1	Bearing support, short
P3410-4A	1	Drive pulley, “compact”, D=100 mm
P3410-5A	1	Drive belt, “compact”
P3410-1A	1	Assembly platform for MBCs

Recommended accessories and power supply:

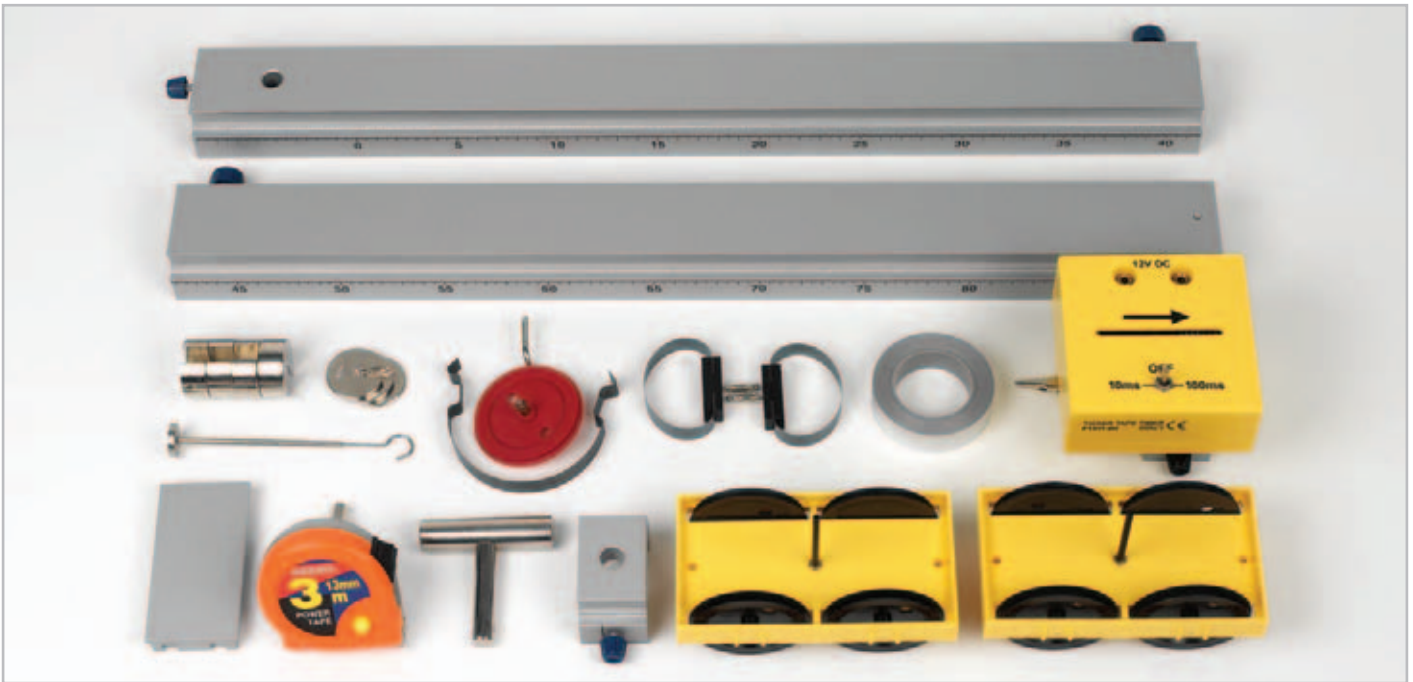
See also electricity compact system

MB201-2B	1	MBC Variable battery, 4.5 V
P3712-1S	2	Jumper plugs, “compact”, black





compact system mechanics



DM990-M4 Mechanics 4 “compact system” dynamics set, consisting of:

P5310-1B	1 Track and optics bench, 2x50 cm, segmented	P1120-2F	4 Slotted weights, 50 g, SE
P5310-1C	1 Rail connector SE	P1100-1S	1 Measuring tape on support, 3 m
P7240-2B	1 Support rod, t-shaped	P1311-2H	1 Ticker tape timer
P5310-1E	1 Sliding saddle for optics bench	P1311-2G	1 Metallic paper, roll
P1230-3A	1 Pulley with bracket	P1311-2D	2 Spring bumpers
P1311-2A	2 Dynamics trolleys, SE	P1311-2E	1 Flat spring for trolley
P1120-2C	1 Holder for 10 g slotted weights, SE	P7813-M4	1 Box insert M4 cs
P1120-2D	3 Slotted weights, 10 g, SE	P7806-1B	1 Storage box, large



Recommended accessory:

P1311-2B 1 Motorized trolley

Recommended accessory set for timing, consisting of:

P1320-3LR 2 Light gates
 P1320-1H 2 Rail holders for light gates
 MB312-1T 1 MBC timer
 P1320-1P 1 Magnetic plate for MBC timer

Power supply required for MBC timer module:

P3130-1P 1 Mains transformer 12V / 2 A
 Recommended supplement:

DM102-4S

DS102-3B 1 Clamp saddle with fixing screw
 P3711-2R 1 Coil with 800 turns, blue
 P3911-2G 1 Iron core, slotted with screw
 P7100-1A 1 Cord, 30 m roll, high tensile strength
 P3310-7S 2 Connecting leads, 4-mm plug / 2-mm jack
 P1323-9A 1 Connecting cable for counter
 P3711-1F 1 Fixing screw, M3, short
 DM281-2K 1 Plug with contact plate
 DM281-1H 1 Hook with plug
 DM121-1A 1 Weight on hook 5 g

Launcher, electromagnetic, “compact”, consisting of:

1 Clamp saddle with fixing screw
 1 Coil with 800 turns, blue
 1 Iron core, slotted with screw
 1 Cord, 30 m roll, high tensile strength
 2 Connecting leads, 4-mm plug / 2-mm jack
 1 Connecting cable for counter
 1 Fixing screw, M3, short
 1 Plug with contact plate
 1 Hook with plug
 1 Weight on hook 5 g

compact system mechanics



Recommended supplement - falling body apparatus:

MB312-1F Falling body apparatus, "compact"

Consisting of:

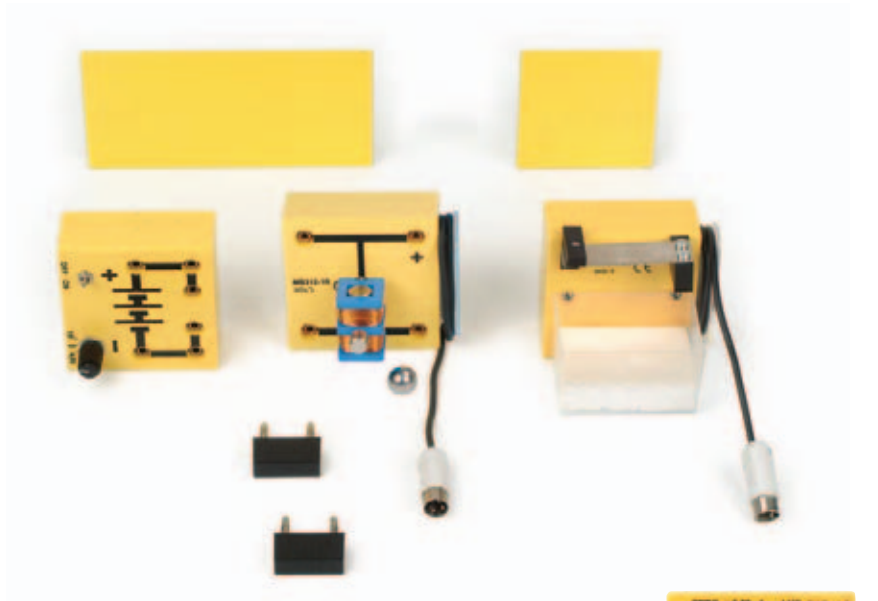
- MB312-1R 1 Ball holder, electromagnetic
- MB312-2R 1 Collector unit with contact plate

For mounting MBC modules magnetically on a support frame:

- P1320-2P 1 Plate with clamp, single
- P1320-3P 1 Plate with clamp, double

Power supply for the electromagnetic ball holder:

- MB201-2B 1 MBC Variable battery, 4.5 V
- P3712-1S 2 MBC jumper plugs, black



DM990-M5 Mechanics 5 "compact system" vibrations set consisting of:

- MB200-2S 1 Motor for wave generator, "compact"
- MB250-3F 1 Function generator, "compact"
- P3712-1S 2 MBC Jumper plugs, black
- P1810-3B 1 Elastic string, white, L=1 m
- P1810-1F 1 Marking pen holder
- P1810-2D 1 Flat spring, steel, L=300 mm
- P1810-1G 1 Threaded rod with wing nut
- P1810-2A 1 Coil spring, 3N/m
- P1810-2B 1 Coil spring, 20 N/m, D= approx. 12 mm

Accessory required for falling body apparatus MB312-1F and Mechanics 5 DM990-M5:

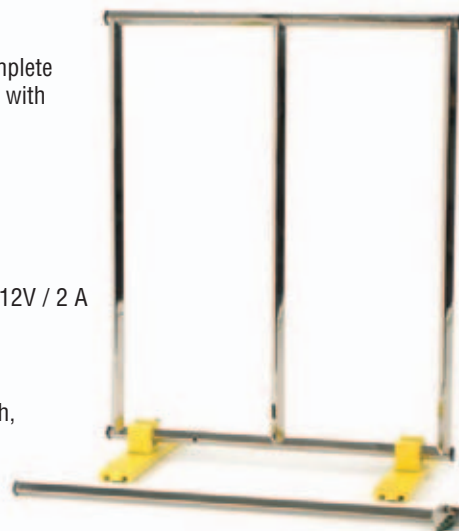
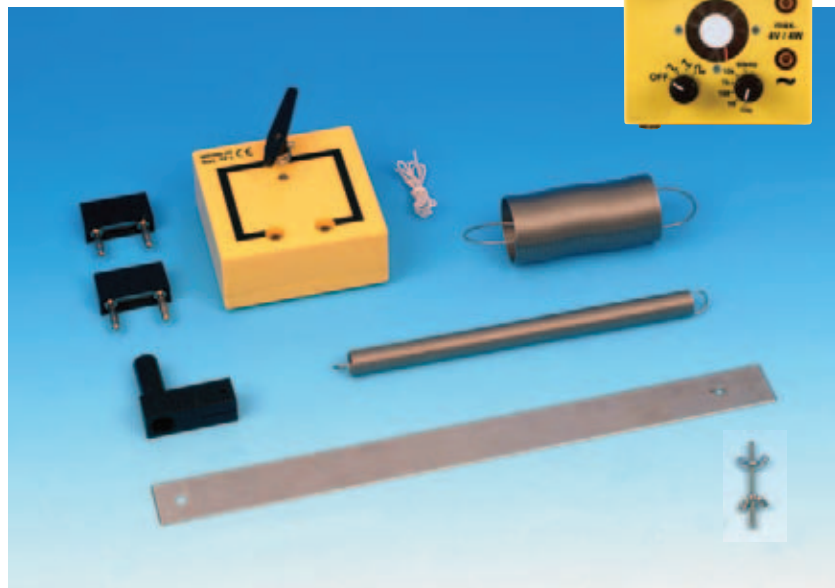
- P7211-1S 1 Support frame, complete
- P7230-2L 2 Clamps on support with bearing pin
- P7230-2M 1 Square clamp

Power supply required for function generator MB 250-3F:

- P3130-1P 1 Mains transformer 12V / 2 A

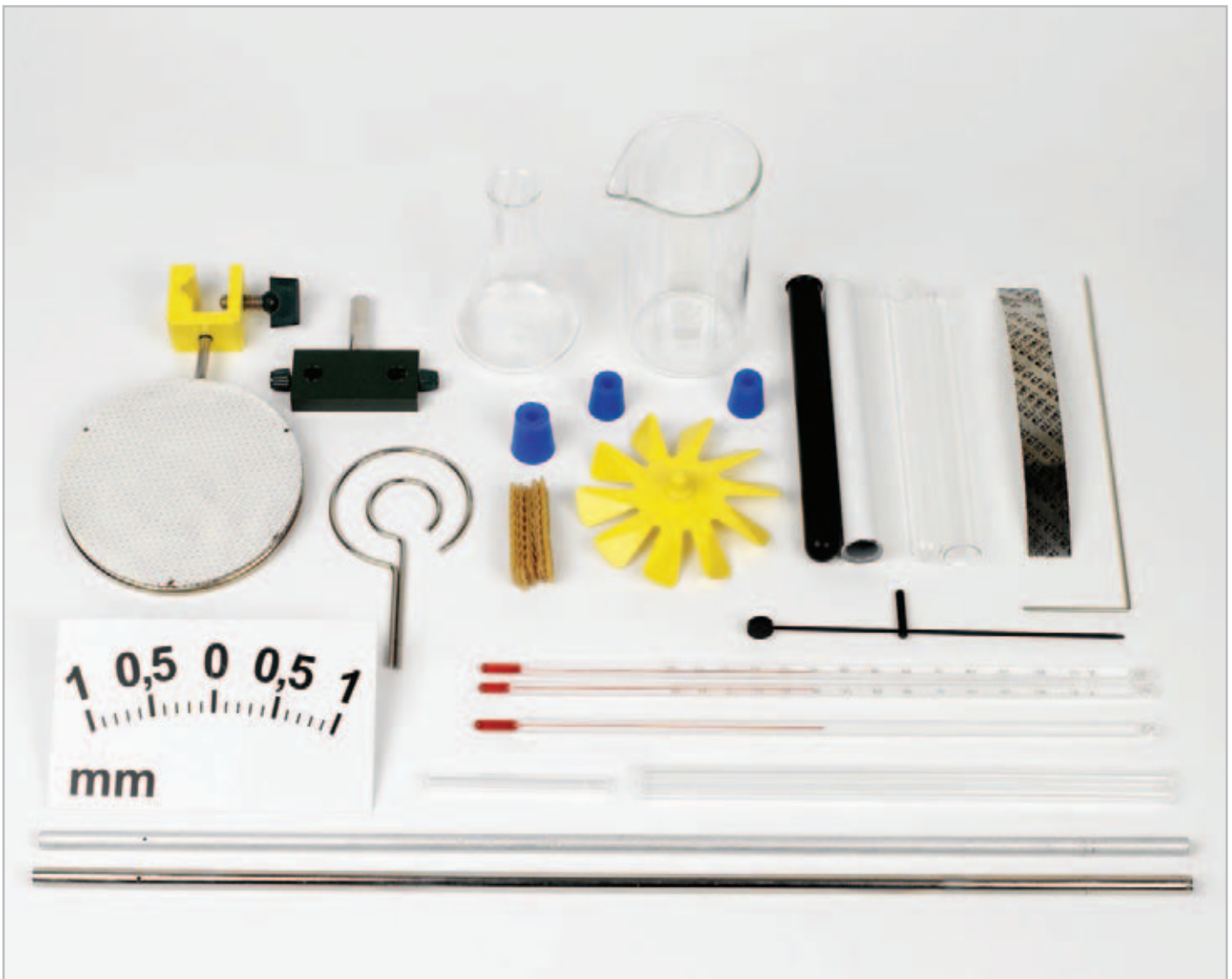
Recommended accessory:

- P1150-1D 1 Handheld stopwatch, digital, SE, 1/100 s





compact system thermodynamics



DT990-T1 Thermodynamics “compact system” consisting of:

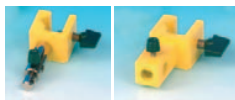
P7125-2M	1 Ceramic thermal protection mesh permanently mounted on ring clamp	P2400-1B	1 Tube for thermal expansion, iron
P7251-1S	1 Support ring, D=30 mm	P2600-5C	1 Wax
P7251-1T	1 Support ring, D=62 mm	P2610-2A	1 Needle with bend
P7251-3T	1 Double tube holder	P2610-3W	1 Propeller for demonstrating thermal flow
P2220-1A	2 Laboratory thermometers, -10 ... +110 / 1 °C, alc.	P2420-1A	1 Bimetallic strip SE
P2220-9A	1 Laboratory thermometer, -10 ... +110 / not graduated, alc.	P7405-2A	2 Test tube, 16x160 mm
P7400-1C	2 Tubes, D=8 mm, L=200 mm, acrylic	P2620-3B	1 Objects for testing heat radiation, pair
P7422-2B	1 Glass tube, straight, L=80 mm	P7130-3B	2 Stoppers, silicone, 14/18/20 mm, 1 hole
P2400-1Z	1 Pointer for longitudinal expansion	P7130-4B	1 Stopper, silicone, 17/22/25 mm, 1 hole, SB 19
P2400-3S	1 Scale for longitudinal expansion on clamp	P7410-1D	1 Beaker, tall, 250 ml
P2400-1A	1 Tube for thermal expansion, aluminium	P7412-1B	1 Erlenmeyer flask, narrow neck, 100 ml
		P7813-T1	1 Box insert T1 cs
		P7806-1B	1 Storage box, large

compact system thermodynamics



DM990-Z1 Mechanics & thermodynamics “compact system” accessories

Accessories required for DM990-M1 and DT990-T1



See page 203 for detailed description



Recommended accessories:

- P2700-1D 1 Joule's calorimeter
- P7020-4A 1 Sodium thiosulphate, 200g
- P7125-3M 1 Ceramic thermal protection mesh, D=100 mm, replacement
- C4350-1A 1 Student thermometer, digital, 200 °C



P2110-1A Gas cartridge burner

Bunsen burner for use with pierced gas cartridges or with valve connector; includes needle valve and air regulator (supplied without cartridge); D = 114 mm, H = 185 mm

P2110-1C Gas cartridge, pierced

190 g, propane-butane mixture in a safety tank in acc. with the EN417 standard

P2110-1V Gas cartridge, with valve

210 g, propane-butane mixture in a safety tank in acc. with the EN417 standard

P2112-1A Teclu burner for cartridge with valve

Teclu burner adapter, with thread for P2110-1V cartridge with valve; includes needle valve and air regulator; max. temperature: 1450 °C; total height with cartridge: 230 mm

C7411-1A Gas lighter, mechanical

Total length: approx. 155 cm

C7411-1E Replacement flints, set of 3

For gas lighter C7411-1A (not shown)

DT427-1B

High-temperature spirit burner

Safe, easy-to-use, powerful burner with an innovative design requiring **(no wick)**, a gasket in the lid allows pivoting; flame temperature: approx. 800 °C; supplied without contents; max. volume capacity: 100 ml; height: approx. 85 mm





experiment topics

compact system mechanics

Mechanics 1 - 3

Properties of bodies (measuring physical properties)

- MEC 001 Measuring length with a ruler and vernier callipers
- MEC 002 Measuring time
- MEC 003 Determining the volume of liquids
- MEC 004 Determining the volume of solid bodies by liquid displacement - graduated cylinder
- MEC 005 Determining the volume of solid bodies by liquid displacement - overflow beaker
- MEC 006 Determining the volume of gases
- MEC 007 Diving bell
- MEC 008 Beam balance
- MEC 009 Determining the density of solid bodies with the same mass
- MEC 010 Determining the density of solid bodies with the same volume
- MEC 011 Determining the density of liquids

Statics of solid bodies - forces and their effects

- MEC 012 Forces cause deformation
- MEC 013 Mass and weight
- MEC 014 Mass, weight and gravity
- MEC 015 Proportionality of weight and mass
- MEC 016 Stretching an elastic band
- MEC 017 Bending a flat spring
- MEC 018 Measuring force
- MEC 019 Hooke's law
- MEC 020 Direction of force and point of application
- MEC 021 Force and opposing force, action equals reaction
- MEC 022 Components of equidirectional forces
- MEC 023 Balance of forces
- MEC 024 Components of non-parallel forces
- MEC 025 Components of three forces
- MEC 026 Inclined plane - downhill force
- MEC 027 Force components on an inclined plane

Statics of solid bodies - torque

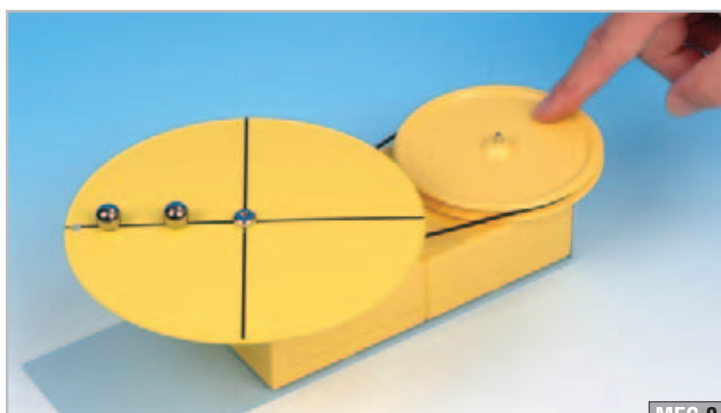
- MEC 028 Angular hoist
- MEC 029 Two-sided lever
- MEC 030 One-sided lever
- MEC 031 Centre of gravity
- MEC 032 Stability
- MEC 033 Stability against tilting

Friction

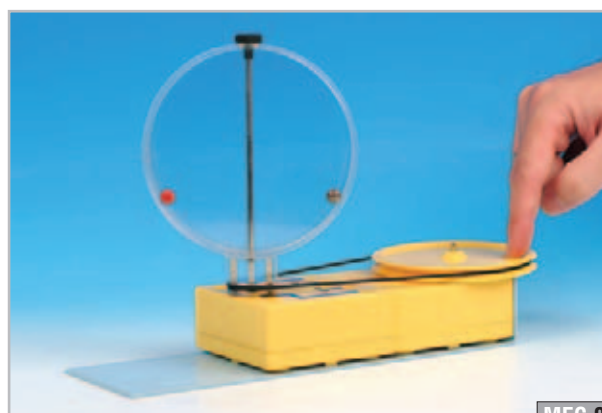
- MEC 034 Static friction
- MEC 035 Sliding friction
- MEC 036 Rolling friction
- MEC 037 Determining the coefficient of friction



experiment topics compact system mechanics



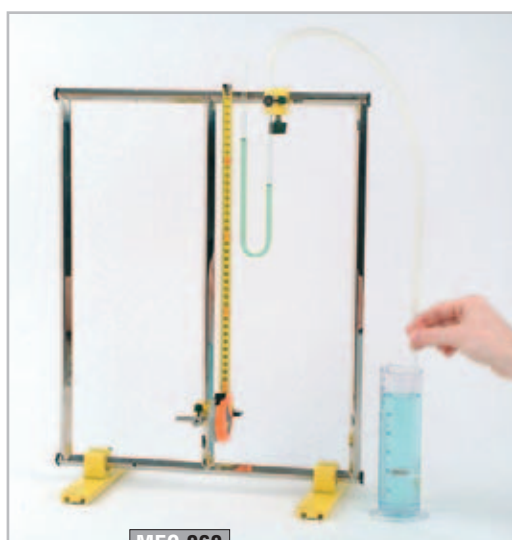
MEC 041



MEC 042



MEC 056



MEC 060



MEC 069

Motion change due to force

- MEC 038 Propulsion by water jet
- MEC 039 Propulsion by air jet
- MEC 040 Horizontal and inclined discharge - water jet

Circular motion

- MEC 041 Centrifugal force
- MEC 042 Centrifugal force - rotational dynamics paradox
- MEC 043 Centrifugal governor
- MEC 044 Centrifugal force - centrifugal hoops
- MEC 045 Rotating liquids
- MEC 046 Rotating pendulum

Work - conversion of energy

- MEC 047 Mechanical work
- MEC 048 Work on an inclined plane
- MEC 049 Conservation of energy in a pendulum
- MEC 050 Potential energy - kinetic energy
- MEC 051 Artesian well

Simple machines

- MEC 052 Fixed pulley
- MEC 053 Movable pulley
- MEC 054 Simple block and tackle
- MEC 055 Block and tackle with four pulleys

- MEC 056 Wheel and axle
- MEC 057 Belt drive
- MEC 058 Gear drive
- MEC 059 Overshot and undershot waterwheel

Pressure in fluids

- MEC 060 Measuring hydrostatic pressure using an immersion probe
- MEC 061 Flow velocity of discharge
- MEC 062 Communicating vessels

Pressure in gases

- MEC 063 Overpressure and underpressure
- MEC 064 Measuring underpressure
- MEC 065 Effects of air pressure
- MEC 066 Volumetric pipette

Buoyancy in liquids and gases

- MEC 067 Buoyancy in liquids
- MEC 068 Floating - suspension - sinking
- MEC 069 Archimedes' principle
- MEC 070 Model of a hydrometer

Molecular forces - surface tension

- MEC 071 Capillary attraction



experiment topics

compact system mechanics

Mechanics 4 - 5

Dynamik

- MEC 101 Uniform linear motion
- MEC 102 Uniform linear motion: same time - same distance
- MEC 103 Velocity of uniform linear motion
- MEC 104 Relationship of time and distance in uniform linear motion
- MEC 105 Non-uniform linear motion
- MEC 106 Non-uniform linear motion - mean velocity
- MEC 107 Uniformly accelerated motion
- MEC 108 Relationship of time and distance in accelerated linear motion
- MEC 109 Relationship of velocity and distance in accelerated linear motion
- MEC 110 Free-fall acceleration
- MEC 111 Newton's second law of motion
- MEC 112 Collision experiments - impulse-momentum theorem
- MEC 113 Dynamic measurement of mass
- MEC 114 Potential and kinetic energy

Vibrations

- SWC 001 Period of oscillation of simple pendulums
- SWC 002 Period of oscillation of spring pendulums
- SWC 003 Period of oscillation of flat springs
- SWC 004 Recording time and distance of harmonic oscillations
- SWC 005 Measuring gravitational acceleration
- SWC 006 Resonance of simple pendulums
- SWC 007 Resonance of spring pendulums
- SWC 008 Dynamic measurement of spring constants

Waves

- SWC 009 Transverse standing waves
- SWC 010 Longitudinal standing waves
- SWC 011 Reflection of waves at a fixed and loose end



experiment topics

compact system mechanics



Thermodynamics

Propagation of heat

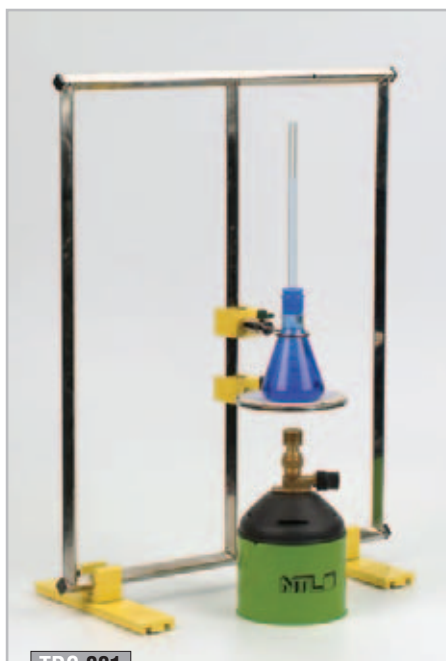
- TDC 001 Model of a thermometer
- TDC 002 Calibrating a thermometer scale
- TDC 003 Bimetals
- TDC 004 Longitudinal expansion of solids (qualitative investigation)
- TDC 005 Longitudinal expansion of solids (quantitative investigation)
- TDC 006 Expansion of the volume of liquids

- TDC 007 Changes in air volume at constant pressure
- TDC 008 Changes in air pressure at constant volume
- TDC 009 Thermal conduction
- TDC 010 Thermal flow
- TDC 011 Heat radiation
- TDC 012 Thermal insulation

Change of states

- TDC 021 Mixing temperature
- TDC 022 Specific heat of water

- TDC 023 Specific heat of solids
- TDC 024 Calculating the specific heat of solids
- TDC 025 Melting point
- TDC 026 Melting heat
- TDC 027 Freezing mixture
- TDC 028 Solidification heat
- TDC 029 Boiling point
- TDC 030 Evaporation heat
- TDC 031 Distillation



TDC 001



TDC 005



TDC 007



TDC 005



TDC 031