Cornelsen Experimenta

Science Kits

for secondary school level

Cornelsen

Contact

About us

Cornelsen Experimenta® is producer of teaching material for natural sciences – from Kindergarten to secondary school. We are part of the Franz Cornelsen Educational Group which roots go back to Cornelsen Publishing with more than 75 years of experience in the educational market.

Our company is one of the largest and most important providers for educational material in Germany and more than 60 other countries worldwide. Our trade mark is the 'red case' that includes the teaching material for science. We have more than 40 % market share in German elementary schools, secondary schools and Kindergarten and are proud to say that "Every German school has at least one 'red case' with Cornelsen Experimenta® science material." We inspire since with our material, teachers enable students to understand, internalize and discover the magic of natural science.

Cornelsen Experimenta® is a manufacturing company located in Berlin with approximately 40 employees, partnerships with external authors, cooperation with universities and more than 250 deliverers worldwide. Our product portfolio contains at least 200 cases in which we assemble 6.000 single parts.

Come and join our community and discover a modern, outstanding company with high-end quality products that make you and our common customer – teachers and students – learn enthusiastically natural science accompanied with experiments from Cornelsen Experimenta®.

Quality Assurance

It is the aim of Cornelsen Experimenta® to develop and produce teaching material of high quality for activity-oriented natural science classes. Our products are of high quality and fail-safe.

Cornelsen Experimenta® has established an extensive quality management system which is regulary audited, internally and externally.

Cornelsen Experimenta® has been certified according to ISO 9001:2015. It is ensured that the demands of the customers will be realized and fulfilled with high quality.

Disclaimer

The products shown in this catalogue are continuously adapted to the changing technological and educational developments. Illustrations and descriptions are not binding in their entirety. Errors and omissions are excepted.

TÜVRheinland®
ZERTIFIZIERT

Management System
ISO 9001:2015

www.tuv.com
ID 9105061586

The Cornelsen Experimenta Team

Contents

Physics Students Kits

Physics Demonstration Kits

Supporting Equipment

Digital Learning

Chemistry Students Kits

Biology Students Kits

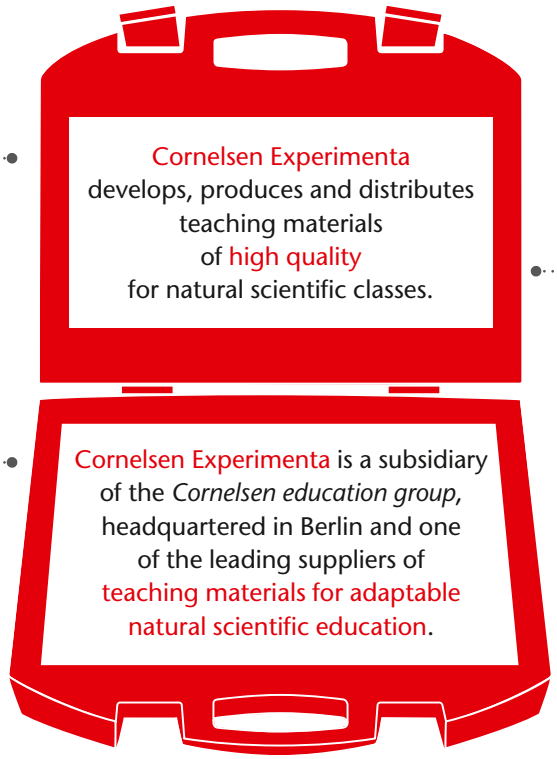
Cornelsen Experimenta® …

… kits allow teachers to gain extra time for other important educational tasks. The kits provide the means teachers and educators need to support them to grant successful classes.

… offers complete solutions, based on an integrated media system. The components of this system – kits and manuals – match each other.

… uses for the production of their teaching aids only quality raw materials. All raw materials are RoHs compliant. All plastic (or other) materials and colours are free of dangerous components and electrical parts used in combination with our educational materials do comply with all CE and other international safety standards.

… has established an extensive quality management system which is regularly audited, internally and externally. Cornelsen Experimenta has been certified after ISO 9001:2008.

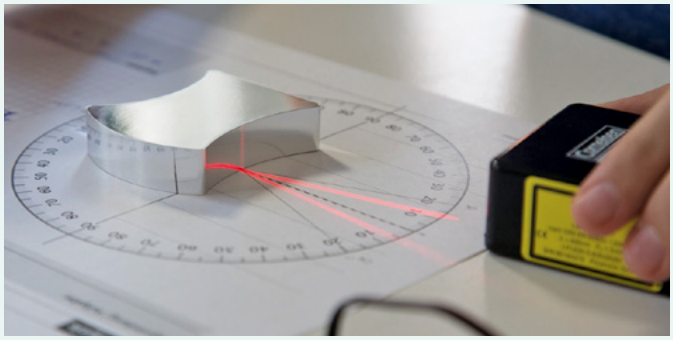


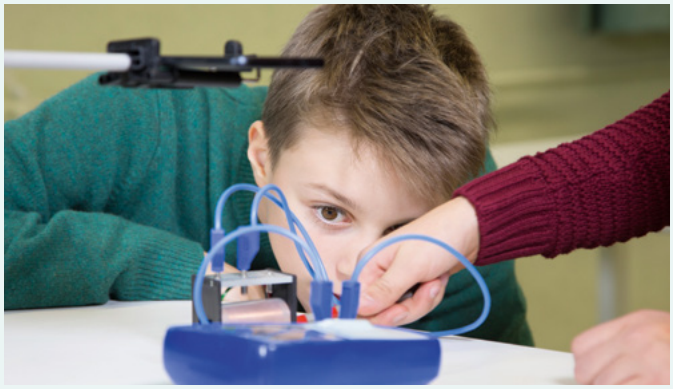
… acknowledges the enormous importance to introduce students to experimental learning in their daily school routine. It is our idea that students should work independently to reach sustainable learning success.

… products are subject to the directive 2009/48/EG of 18/06/09, annex 1, no. 13.

… offers a 2 years warranty for all products purchased from us.

… offers a complete service of supplying spare parts. All components of our kits can be reordered separately.





Science kits for the secondary school

Physics – Pages 4 – 45

Chemistry – Pages 88 – 97

Biology – Pages 98 – 101

Students kits

- Are solid and specially designed for students
- Make it possible to work simultaneously on different subjects
- Encourage the students to act independently
- Contain all necessary equipment
- Contain comprehensive, detailed manuals
- Do not require special labs

Pages 46 – 77

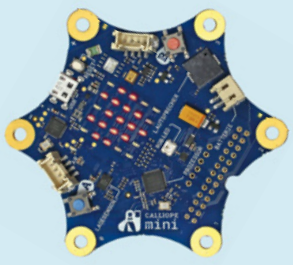
Demonstration kits

- Allow performing the fundamental experiments at all secondary school levels
- For a profound and successful science education
- No special science lab needed
- All required materials contained
- No additional equipment required
- Detailed manuals and instructions included

Digital Learning

Pages 82 – 87

- With coding and robotics for computational thinking
- Calliope mini
- eXperiBot
- eXperilyser®



Age 13 – 18

Students kit Mechanics

This kit contains equipment and resources required for investigating the basic laws of solid, liquid and gaseous bodies.

- Solid bodies Forces and their effects, laws of levers, mechanical scales, processes involving pulleys or block and tackle, inertia and friction, advantages of inclined planes and much more
- Liquids Properties and behaviour of surfaces open to air, propagation of pressure and lift, technical applications and much more
- Gaseous bodies Effects of normal air pressure and other different pressure conditions along with principles of how heat engines function

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

43000	Materials for 1 work group

All stand equipment included!

▶ This kit covers the following basic laws of physics:

- Newton's 1st law
- Hooke's law
- Archimedes law of the lever
- Archimedes principle
- Boyle's law
- Gay-Lussac's law
- Principle of the Heron's engine
- Newton's 2nd and 3rd law
- Golden rule of mechanics

Detailed instructions for 49 experiments:

Mechanics of solids

- Volume / Density of a body
- Action of forces – extension – Hooke's law
- Spring dynamometer
- Action of forces – Bending
- Bending of a plate spring
- Directional dependence of an applied force
- Combination of forces
- Centre of gravity of a body
- Equilibrium
- Stability
- Inertia of bodies
- Friction
- 1st class lever
- 2nd and 3rd class levers
- Beam scale
- Steelyard
- Fixed pulley
- Moveable pulley
- Fixed pulley plus moveable pulley/Tackle
- Efficiency
- Inclined plane

Mechanics of liquids

- Liquids with free surface
- Communicating vessels
- Levelling in liquids
- Transmission of pressure in liquids
- Cartesian diver
- Principle of the U-tube manometer
- Hydrostatic pressure
- Suction and force pump
- Capillarity
- Adhesive forces
- Surface tension
- Buoyancy in liquids
- Model of a hydrometer
- Floating and sinking
- Utilisation of water power

Mechanics of gases

- Air as a body
- Compression and expansion of a gas
- Effect of atmospheric pressure
- Vacuum and overpressure
- Generation of a partial vacuum
- Principle of a piston pressure gauge
- Model of a wash bottle
- Principle of a diving bell
- Effect of forces applied by a gas (3 experiments)
- Principle of heat engines

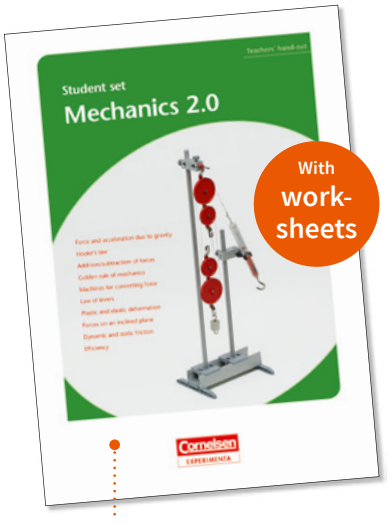
Age 13 – 18

Students kit Mechanics 2.0

Possibility to tie in with mathematics:

- Use of age-appropriate statistics when evaluating
- Testing for proportional correlations
- Introduction of vector summation with overlapping forces. *A geometric analysis is included in the manual.*
- Link to the angular function

Included in delivery:



Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

43010	Materials for 1 work group

All stand equipment included!

▶ This kit covers the following basic laws of physics:

- Newton's 1st law
- Hooke's law
- Archimedes law of the lever
- Golden rule of mechanics

Experiments:

- Spring dynamometers, acceleration due to gravity, weight
- Addition and subtraction of forces
- Hooke's law
- Centre of gravity and equilibrium
- Law of levers – 2nd/1st class levers
- Dynamic and static friction
- Forces on an inclined plane
- Elastic and plastic deformation (Leaf springs, Sand)
- Golden rule of mechanics Pulleys: Fixed pulleys, loose pulleys, Block and tackle
- Measurement of efficiency on an inclined plane

Age 13 – 18

Class set Mechanics 2.0

Possibility to tie in with mathematics:

- Use of age-appropriate statistics when evaluating
- Testing for proportional correlations
- Introduction of vector summation with overlapping forces.
  A geometric analysis is included in the manual.

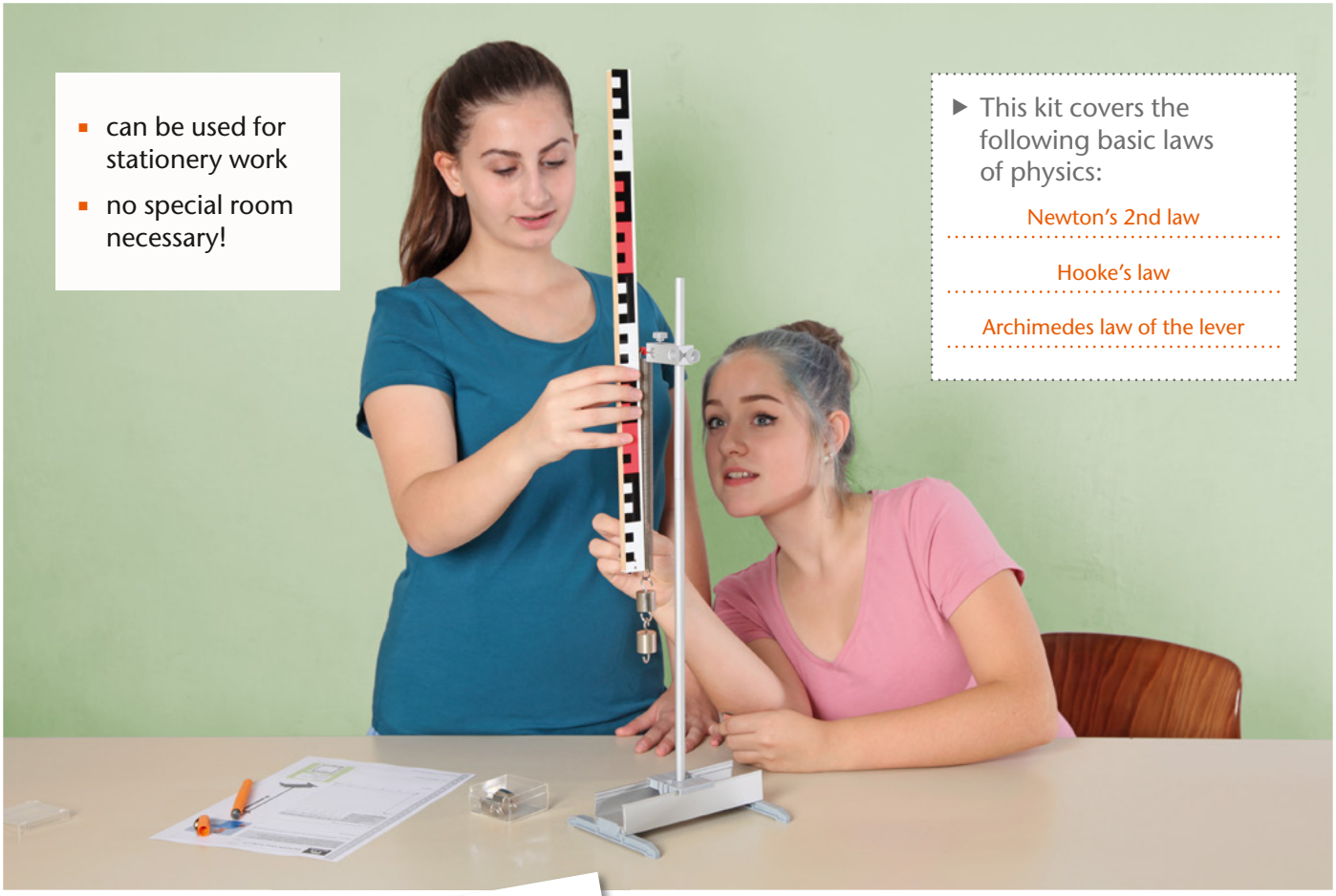
6 groups of students can experiment at the same time

Included in delivery:

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

43020	Materials for 6 work groups



- can be used for stationery work
- no special room necessary!

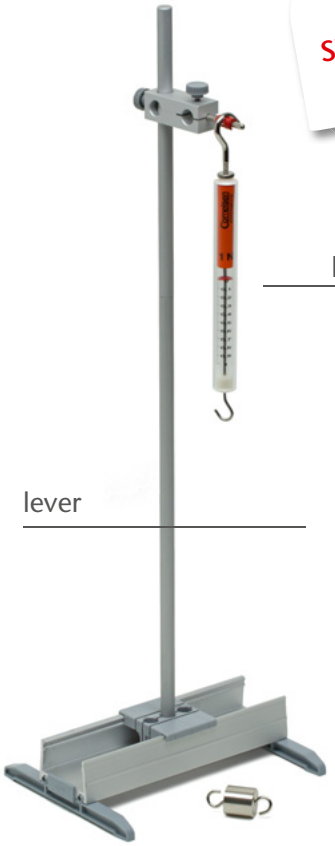
▶ This kit covers the following basic laws of physics:

Newton's 2nd law

Hooke's law

Archimedes law of the lever

All **stand equipment included!**



precise dynamometers

lever

Experiments

- Spring dynamometers, acceleration due to gravity, weight
- Hooke's law
- Centre of gravity and equilibrium
- Law of levers – 2nd/1st class levers
- Elastic and plastic deformation (Leaf springs, Sand)

*Additionally recommended for experiments dealing with the **Golden rule of mechanics**:*

Mechanics 2.0 Additional kit "Pulleys"

With the additional kit the *class set Mechanics 2.0* can be graded up. Experiments on *fixed pulleys*, *loose pulleys* and *block and tackle* can be carried out to explain the **Golden rule of mechanics**.

43022

Age 13 – 18

Students kit Dynamics 2.0

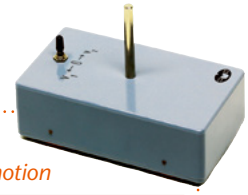
The kit contains equipment and resources required for investigating the basic laws of motion and oscillation. A digital timer is included to support the efficiency of experimenting.

Pupils can make measurements in a conventional manner irrespective of the power supply, but can also analyse the saved results on a PC later on. In addition, the timer can be used as an interface, allowing any measurement to be displayed, processed and saved on a PC or notebook computer.

The measurements are recorded by means of accurate and reliable light barriers. The precisely manufactured carriage with its own propulsion is characterised by the extremely high precision of its movement.

Included in delivery:

1-m-track



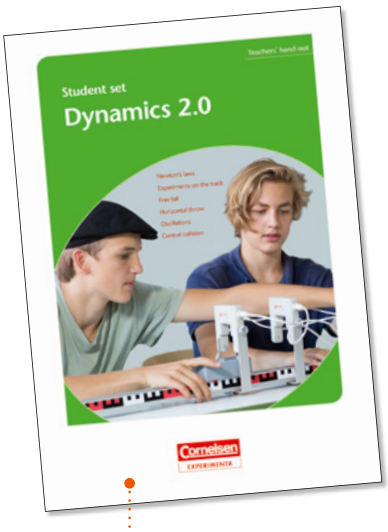
Required for experiments exploring the uniform linear motion

43302 Self-propelled car

Digital timer V-Log

You can exactly measure

- Time
- Speed
- Acceleration
- Period of oscillation



Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

4300988 Materials for 1 work group

Detailed instructions for 15 experiments:

- Newton's laws (2 experiments)
- Relationship between distance and time for uniformly accelerating motion
- Motion plots
- Free fall:
  - Acceleration due to gravity
  - Height of fall – speed of fall
  - Height of fall – time to fall
- Trajectory of horizontally launched projectiles
- String pendulums
  - Period of oscillation
  - Damping
  - Determination of *g*
- Conservation of momentum
- Elastic and inelastic collisions

Experiment with the self-propelled car *43302* (optional):

- Uniform motion in a straight line

▶ This kit covers the following basic laws of physics:

- Newton's laws
- Galileo's equivalence principle
- Huygens' law of collision
- Galileo's laws of pendulum
- Principle of action and reaction

Age 13 – 18

Students kit **Heat**

This kit contains all the equipment and resources for basic experiments on thermodynamics in solid, liquid and gaseous bodies.

Apart from making simple temperature measurements, it is also possible to investigate the principles of how bodies behave in response to changes in temperature.

Further experiments allow for closer observation of the emission, reflection and absorption of thermal energy as well as how it propagates via heat radiation, conduction and convection.

Determination of specific heats and investigation of the processes of evaporation, boiling and condensation round of the range of available experiments.

Additional 6 V DC power supply required, e.g.:

68533 Power supply unit 6 V (see page 79)

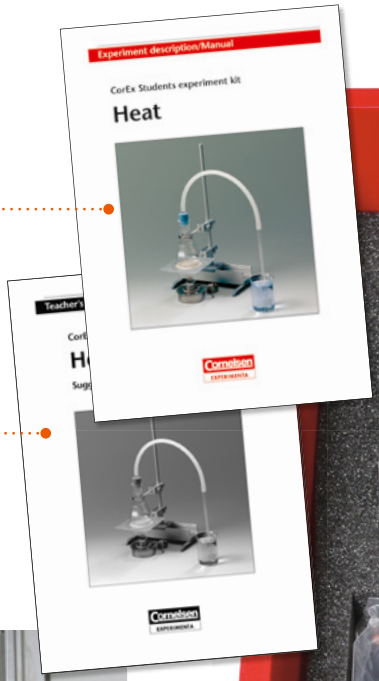
▶ This kit covers the following basic laws of physics:

- Boyle's law
- Gay-Lussac's law
- Fourier's law
- Stefan-Boltzmann law

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



48500 Materials for 1 work group

Detailed instructions for 20 experiments:

- Model of a thermometer
- Measurement of temperatures
- Heating and cooling
- Thermic behaviour of liquids
- Thermic behaviour of gases
- Thermic behaviour of solids
- Thermal conductivity of solids
- Thermal conductivity of liquids
- Bimetal-thermometer
- Heat radiation
- Reflection of heat radiation
- Absorption of heat radiation
- Heat flow – convection
- Temperature of mixture
- Specific heat of water
- Specific heat of solids
- Vaporization and condensation
- Distillation
- Utilization of heat energy

Age 13 – 18

Students kit Energy conversion

This kit contains all the equipment and resources for a host of experiments on conversion of energy from one form to another.

It is possible for thermal energy, mechanical en-ergy, light energy or chemical energy to be turned into electrical energy or vice versa and in any other combination.

The possible experiments are completed by a set of exercises involving storage of energy.

Additional 1.5 to 12 V DC power supply required, e.g.:

55223 Power supply unit, 1.5 to 15 V/1.5 A DC (see page 79)

Additional meter required, e.g.:

54985 Digital Multimeter with Bargraph (see page 81)

▶ This kit covers the following basic laws of physics:

Mayer's law of conservation of energy

Clausius' 2nd law of thermodynamics

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

48550 Materials for 1 work group

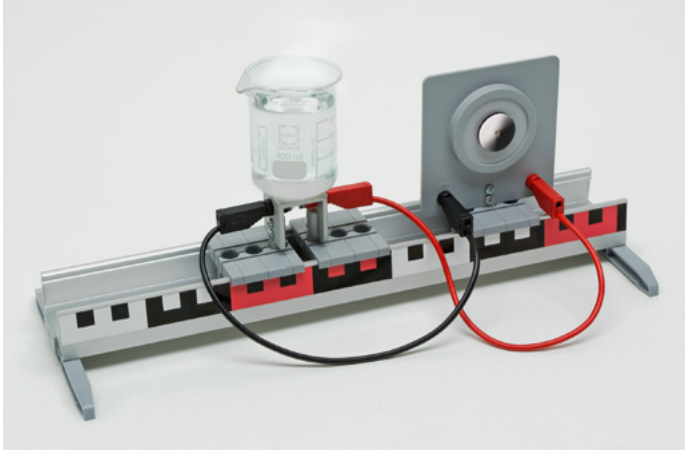
Renewable Energies

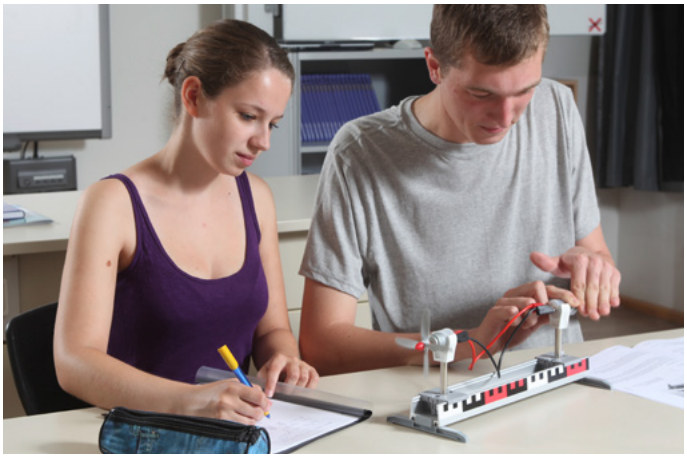
Detailed instructions for 26 experiments:

Experiments with conversion of energy:

- mechanical energy ↔ electrical energy
- electrical energy ↔ mechanical energy
- mechanical energy ↔ thermal energy
- thermal energy ↔ electrical energy
- light energy → electrical energy
- light energy → mechanical energy
- chemical energy ↔ electrical energy
- chemical energy → mechanical energy
- electrical energy ↔ flow energy

- Bernoulli-Effect
- Stages of energy conversion
- Measurement of thermal conduction through conversion
- Measurement of thermal radiation through conversion
- Direct and indirect utilisation of solar energy
- Solar module as energy converter
- Dependence of converted solar energy on the illumination
- Loading of a solar module
- Cooling with sunlight
- Storage of electrical energy through conversion into chemical energy
- Energy conversion and storage





Age 13 – 18

Students kit DynaMot

This kit allows school experiments to be conducted using the DynaMot manually powered generator designed by Dr. Heinz Muckenfuß.

DynaMot can be used as a DC generator or motor in order to replace batteries or power supplies in introductory lessons on electricity (DC circuits).

Since the pupils can 'make' the electricity for most experiments themselves, the basic terminology and concepts about electric circuits can be firmly linked to concrete experience on the generation of electrical energy.

DynaMot makes it possible to illustrate all of the fundamental laws and terminology because it is a physical way of experiencing the physics, illustrating upon what the energy produced by electrical generators depends.

Additional meter required, e.g.:

54870	Analogue Multimeter (see page 80)
	or
54985	Digital Multimeter with Bargraph (see page 81)

Included in delivery:

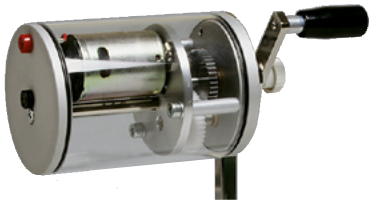
Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

54853	Materials for 1 work group

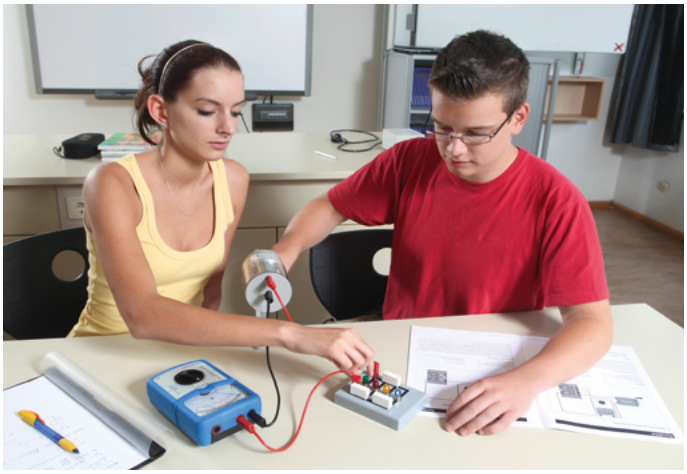
Hand driven generator as power supply

- to support alive teaching
- to help forming concepts in electricity



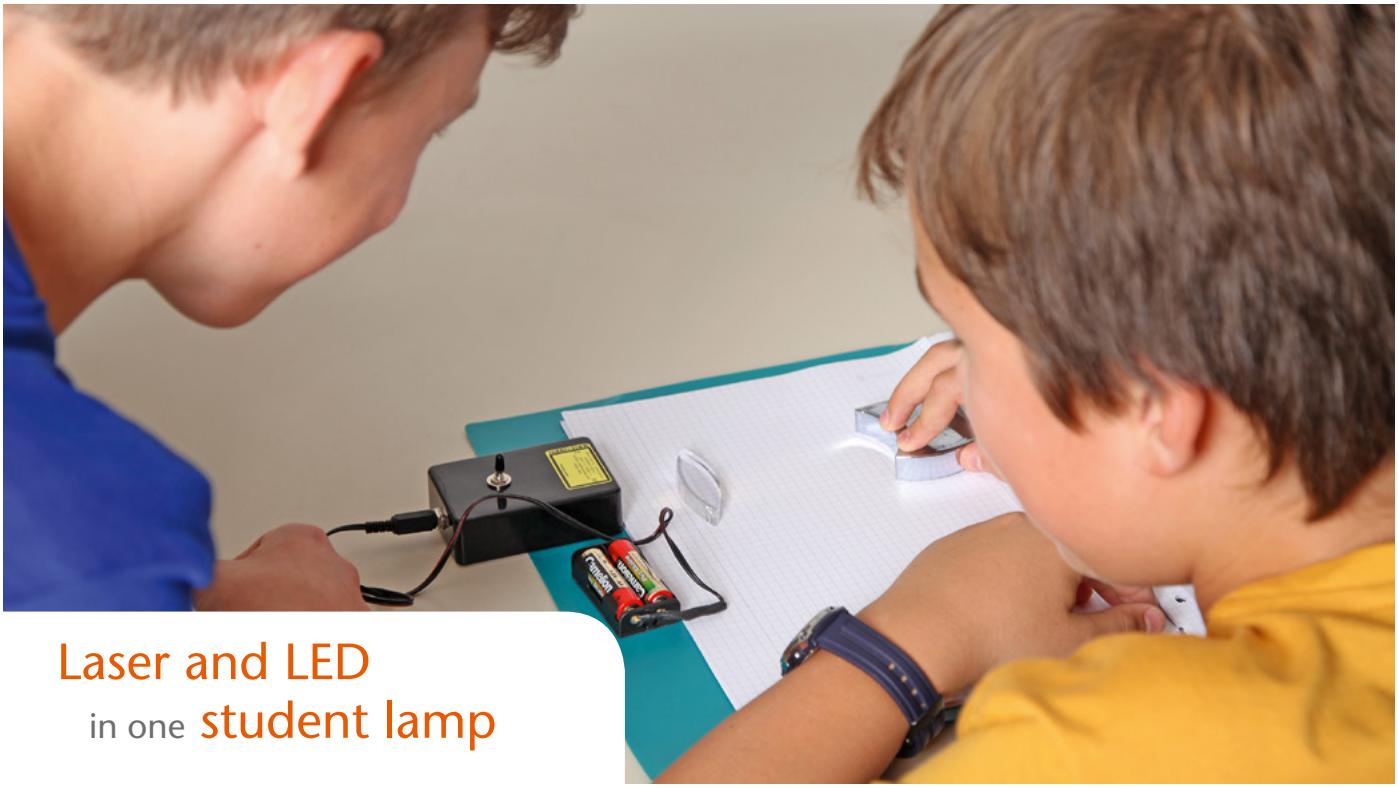
Detailed instructions for 8 experiments:

- Energy flux – Flow of electrons
- Measurement of the flow of electrons
- Energy flux and amperage in parallel connections
- Energy flux and voltage
- Energy flux and voltage in series connections
- Energy conversion – Caloric energy
- Energy conversion – Mechanical energy
- Energy conversion – Chemical energy



Age 13 – 18

Students kit Optics 2.0



Laser and LED in one student lamp

Included in delivery:

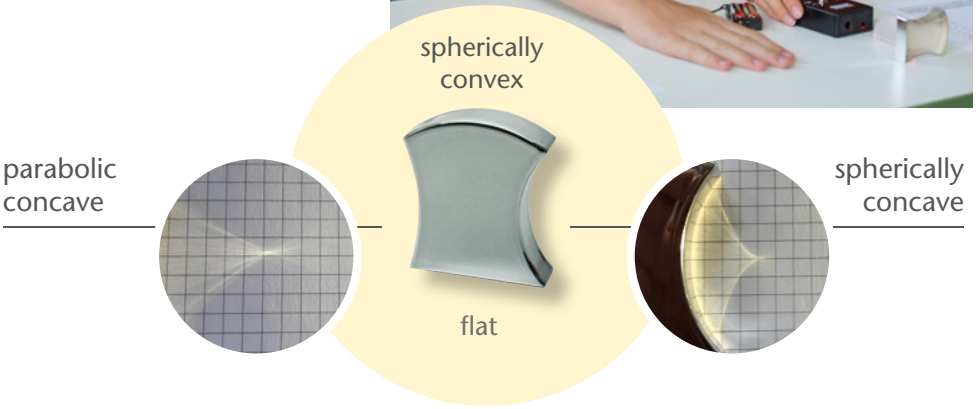
Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

47530	Materials for 1 work group

Universal mirror

- Can produce caustic and focus



▶ This kit covers the following basic laws of physics:

- Newton's corpuscular theory of light
- Galileo's telescope
- Kepler's telescope
- Huygens–Fresnel principle
- Fermat's principle
- Snell's law

Experiments

- Light and shadow
- Law of reflection
- Curved mirrors
- Snell's law of refraction
- Fermat's principle
- Refraction and total internal reflection in water
- Refraction
- Paths of light through lenses
- Focal point of a converging lens
- Formation of images by converging lenses
- Lens equation
- Light and colour
- Optical instruments: Terrestrial telescopes, Astronomical telescopes, Projectors, Optical microscopes

Possibility to tie in with mathematics

$\overline{X}$		
Statistics	Angular function	Proportional correlation

LED that generates less heat

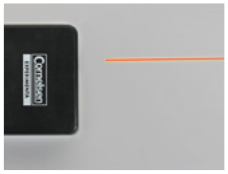
- Very bright, perfect for projections

Student lamp Laser/LED

Laser class 1 **safe for students**
(Certificate available on request)

- Presentation of peripheral rays
- Examining interference and diffraction at different grids
- Discovering polarization with monochromatic light
- Following beam paths directly with the laser

Quick change to optics on a worksheet by switching from LED to Laser

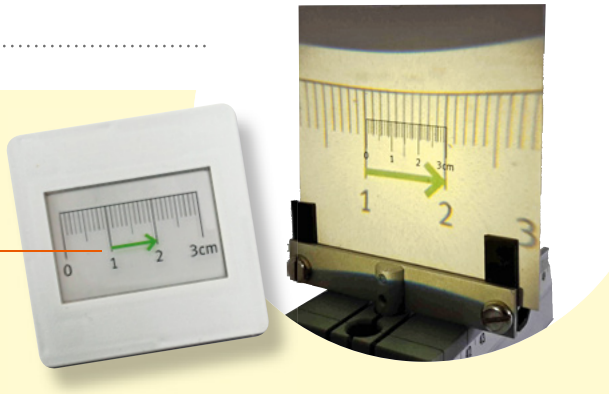


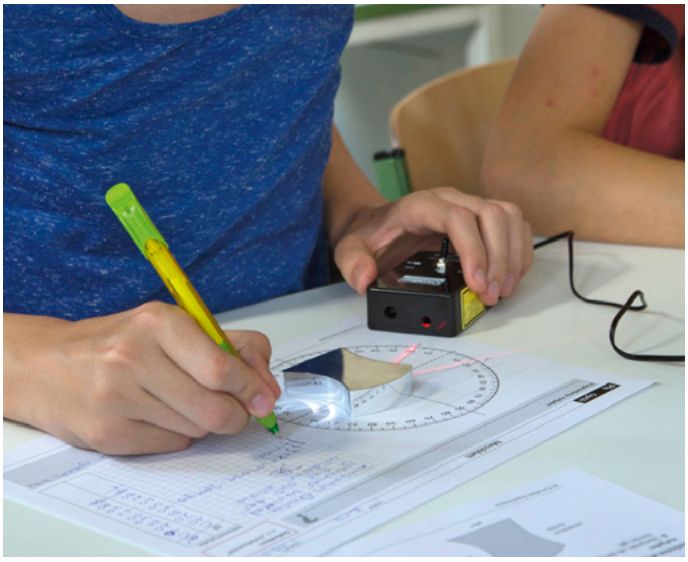
Students kit **Optics 2.0**

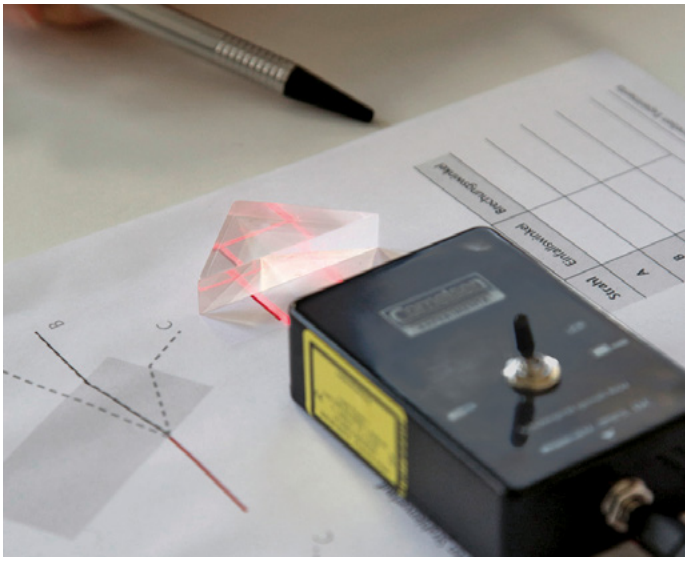
Slide *scale* – direct obvservation

and easy determining of the magnifaction

with arrow

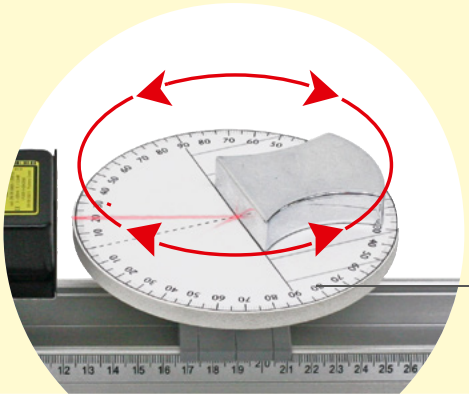






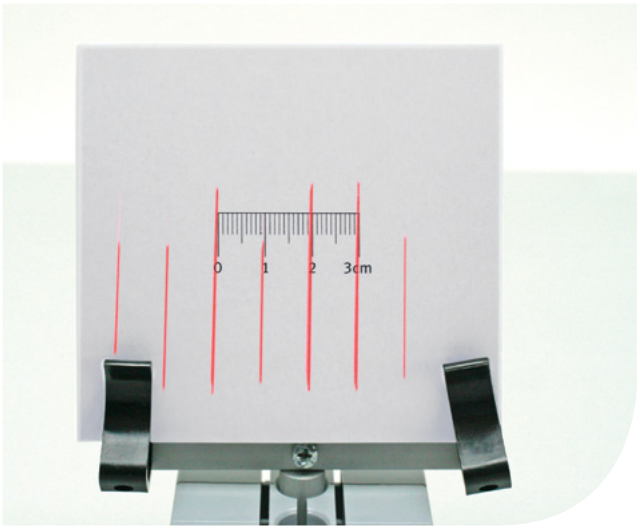
Rotating measuring table

- With angle scale for measuring angle of incidence



Positioning line and perpendicular to optimize optical paths

Optics 2.0 Additional kit "Wave optics"



- The additional kit contains materials and devices for further seven basic experiments
- The parts of the additional kit can be stored in the box of Optics 2.0.

47540

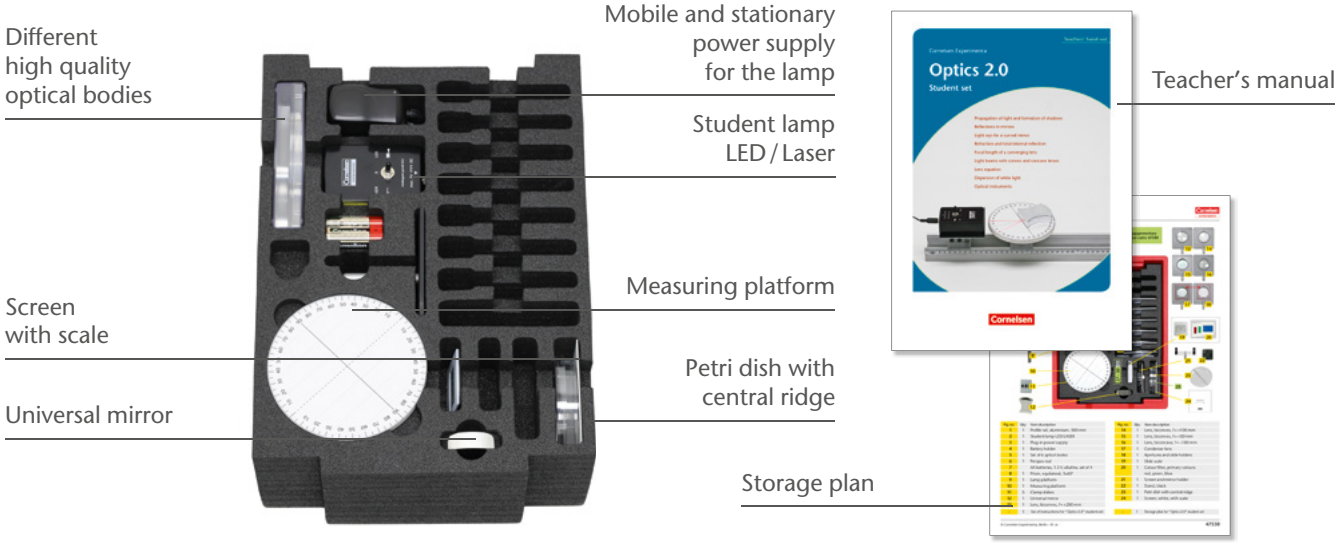
Optics 2.0 Upgrade

Upgrade

You are already working with our **students kit *optics 1*** and want to use the possibilities of the new ***kit optics 2.0***? No problem!

With the upgrade *optics 2.0* you receive all new materials like the student lamp LED/Laser or the universal mirror and the teacher's manual *optics 2.0*. Just remove the missing items from your students kit *optics 1* and put them in the compartments provided in the upgrade.

Included in delivery:



47531 Upgrade Students kit *Optics 2.0* — Materials for 1 work group

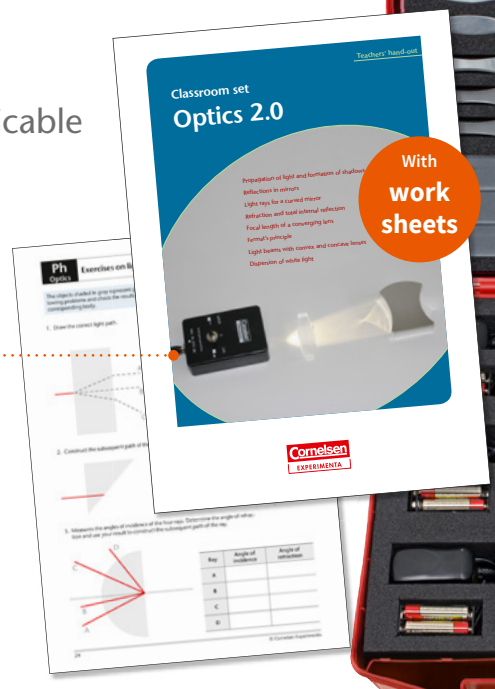
Age 13 – 18

Class set Optics 2.0

6 groups of students can experiment at the same time

Included in delivery:

All experiments practicable on worksheets



Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

47545	Materials for 6 work groups

Laser and LED
in one **student lamp**

see page 21

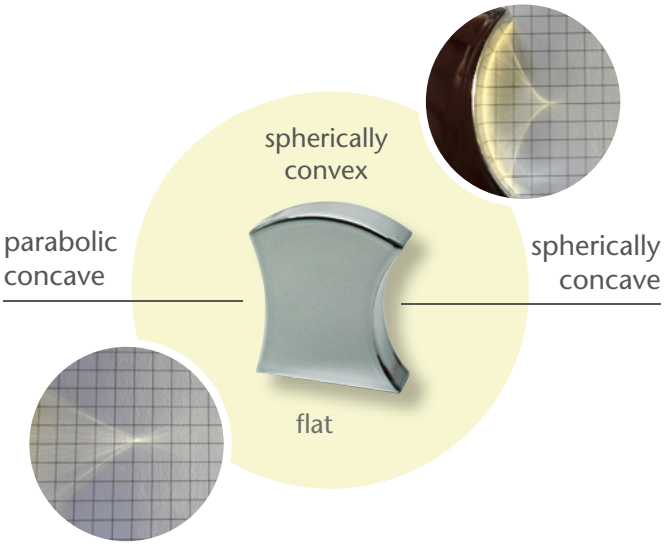
Experiments

- Light and shadow
- Law of reflection
- Curved mirrors
- Snell's law of refraction
- Fermat's principle
- Exercises: Refraction
- Paths of light through lenses
- Focal point of a converging lens
- Light and colour

Possibility to tie in with mathematics		
$\overline{X}$	∿	
Statistics	Angular function	Proportional correlation

Universal mirror

- Can produce caustic and focus



Age 13 – 18

Students kit **Electricity** *complete*

The kit contains equipment and resources required for investigating the basic laws of electrical processes.

To meet the demands of and applications in different types of schools the kit consists of three modules.

The modules you will find on the following pages.

Experiments on current flow and on the electrical basic circuits

- Experiments on the effects of electric current and examinations of selected engineering usage
- The components of the basic unit are stored in a plastic tray.

Electricity – upgrade induction and alternating current

- Continuing experiments on electromagnetism and on electromagnetic induction

The supplement can be stored in the tray of the basic unit electricity 1.

Electricity – upgrade electrostatics, magnetism and electrochemistry

- Examinations to demonstrate the properties of permanent magnets
- Experiments to demonstrate electrical charge and how charges behave
- Experiments to demonstrate the basics of electrochemistry

The components of this supplement are stored in a separate tray.

Included in delivery 23200
Kit *"Electricity"* including circuit board

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

▶ This kit covers the following basic laws of physics:

- Coulomb's law
- Faraday's law of induction
- Ohm's law
- Oersted's law
- Galvanic cell
- Lenz´s law

23200 **Kit *Electricity* including circuit board** Materials for 1 work group

Possibility to tie in with mathematics

$\overline{X}$

Statistics

Experiments 23200:

Electricity – Basics (DC)
- Electrical circuit
- Conductor/ non-conductor
- Conduction in liquids
- Voltage, Amperage
- Electrical resistance
- Ohm's law
- Series connecton
- Parrallel connection
- Dropping resistor
- Voltage divider
- Specific resistance
- Resistance and temperature
- Bridge circuit
- Measuring resistance
- Wattage
- Electrical work

Electricity – Heat energy
- Conversion into heat energy
- Light action
- Conductor and resistance wire
- Fuse
- Bimetallic switch
- Hot wire ammeter

Electromagnetism
- Magnetic field/Oerstedt's experiment
- Electromagnet
- Relay
- Automatic interrupter
- Electric motor

Induction and alternating current (AC)
- Induction
- Induction with DC
- Self-induction
- Lenz's law
- Generator
- Alternator
- AC motor
- Transformer
- Impedance of a coil
- Capacitor
- Impedance of a capacitor

Electrostatics
- Frictional electricity
- Forces acting between charged bodies
- Model of an electroscope
- Electroscope
- Polarisation/induction
- Induction at the electroscope
- Storing charges
- Faraday beaker

Magnetism
- Magnetic Action
- Magnetic field
- Forces acting between magnets
- Magnetic induction
- Geomagnetism/ compass

Electrochemistry
- Electrolysis
- Galvanisation
- Electrochemical element
- Electrochemical potential

Additional power supply required, e.g.:

68533	Power supply unit 6 V (see page 79)
	or
55222	Power supply unit, 12 V/3 A (see page 78)

Additional meter required, e.g.:

54985	Digital Multimeter with Bargraph (see page 81)
	or
54892	Mini Digital Multimeter (see page 81)

Age 13 – 18

Students kit **Electricity** *modules*

Experiments 23210:
Kit *Electricity – Basics:*

Electricity – Basics (DC)
- Electrical circuit
- Conductor/non-conductor
- Conduction in liquids
- Voltage, Amperage
- Electrical resistance
- Ohm's law
- Series connecton
- Parrallel connection
- Dropping resistor
- Voltage divider
- Specific resistance
- Resistance and temperature
- Bridge circuit
- Measuring resistance
- Wattage
- Electrical work

Electricity – Heat energy
- Conversion into heat energy
- Light action
- Conductor and resistance wire
- Fuse
- Bimetallic switch
- Hot wire ammeter

Electromagnetism
- Magnetic field/Oerstedt's experiment
- Electromagnet
- Relay
- Automatic interrupter
- Electric motor

Included in delivery 23210
Kit *Electricity* – Basics including circuit board

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

Kit *Electricity – Basics* including circuit board

23210

23210 Kit *Electricity – Basics* including circuit board

Additional experiments with 23220
Upgrade Induction and Alternating Current (AC):

Induction and alternating current (AC)
- Induction
- Induction with DC
- Self-induction
- Lenz's law
- Generator
- Alternator
- AC motor
- Transformer
- Impedance of a coil
- Capacitor
- Impedance of a capacitor

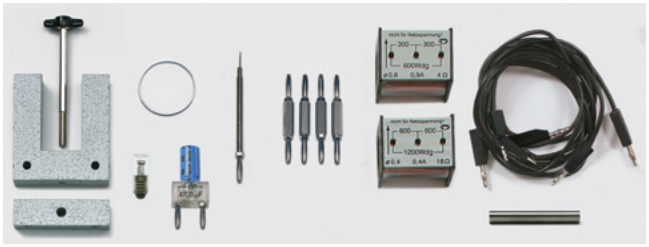
Additional experiments with 23230
Upgrade Electrostatics, Magnetism and Electrochemistry:

Electrostatics
- Frictional electricity
- Forces acting between charged bodies
- Model of an electroscope
- Electroscope
- Polarisation/induction
- Induction at the electroscope
- Storing charges
- Faraday beaker

Magnetism
- Magnetic Action
- Magnetic field
- Forces acting between magnets
- Magnetic induction
- Geomagnetism/compass

Electrochemistry
- Electrolysis
- Galvanisation
- Electrochemical element
- Electrochemical potential

Included in delivery 23220
Kit *Electricity* –
Upgrade *Induction and Alternating Current (AC)*



Kit *Electricity* –
Upgrade Induction and Alternating Current (AC)

23220

The components can be stored in the tray of the kit ***Electricity – basics***.

Included in delivery 23230
Kit *Electricity* –
Upgrade *Electrostatics, Magnetism and Electrochemistry*

Kit *Electricity* –
Upgrade *Electrostatics, Magnetism and Electrochemistry*

23230

23220	**Kit *Electricity* – Upgrade** *Induction and Alternating Current (AC)*
23230	**Kit *Electricity* – Upgrade** *Electrostatics, Magnetism and Electrochemistry*
20402	**Universal circuit board**

Age 13 – 18

Class set Electricity 2.0 *Induction and alternating current*

NEW

With these high-quality materials students from the 9th grade on can carry out experiments in the field of induction and alternating voltage themselves.

Motivated by experiences of their daily life they are able to acquire important knowledge about how magnetism and electricity interact.

Learn more about physics at
cornelsen-experimenta.de/physik

All topics in one case:

- Oersted's experiment
- Magnetic fields of an inductive coil
- Ampère's law
- Electromagnetic induction
- Alternator
- Transformer
- Lenz's rule
- Self-induction
- Impedance

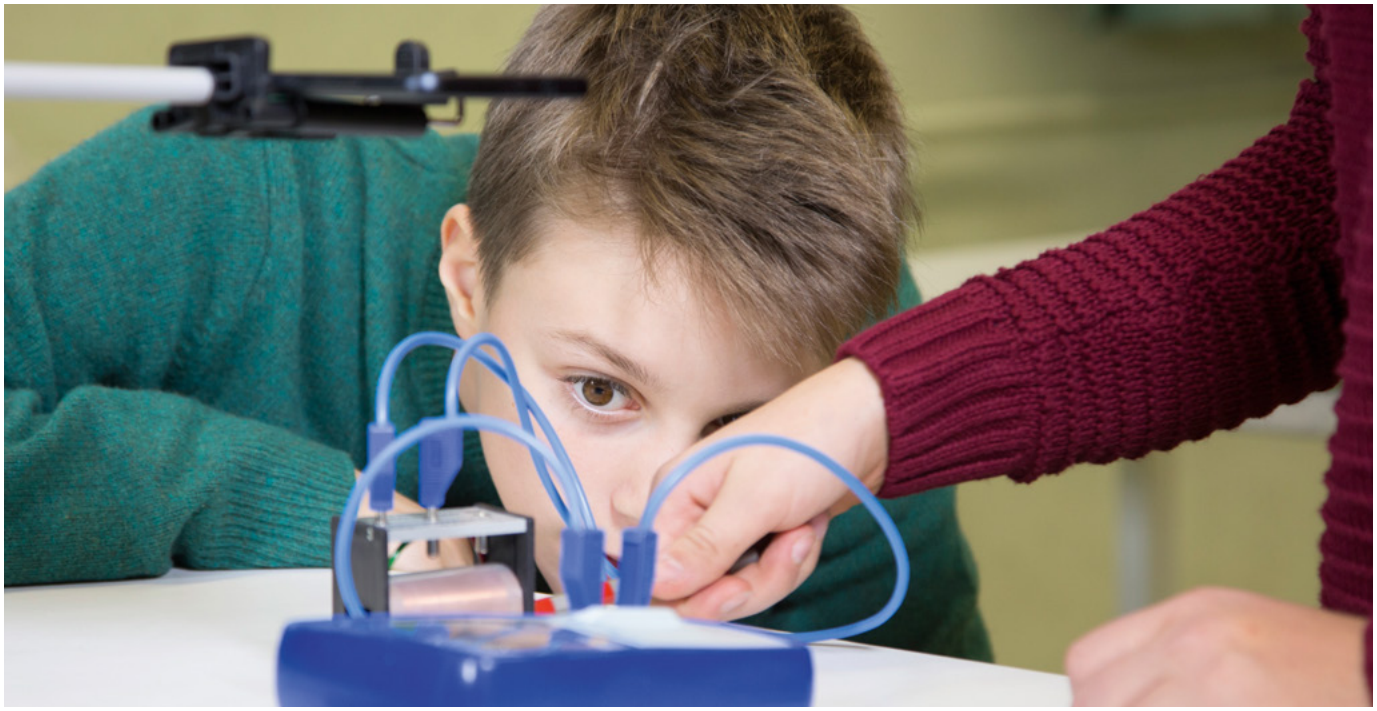
Included in delivery:

All experiments practicable on **worksheets**

Teacher's manual

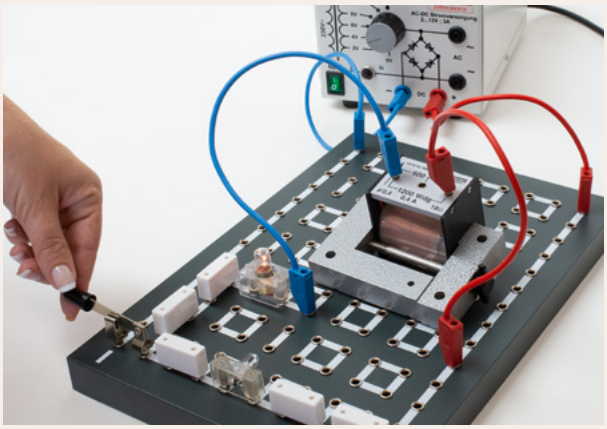
- with 9 copiable worksheets among many other things

54075 Materials for 6 work group



Special equipment:

- **U- and I-shaped ferrite core** for student experiments



The following experiments in this set are also suitable for senior highschool students:

- Magnetic fields of current-carrying conductors and coils
- Induction in coils
- Generator
- Transformer
- Lenz's rule
- Delayed switch-on process with a parallel connection of inductive and resistive elements
- switch-on and switch-off behaviour of inductive coils
- Impedance

Recommendes equipement:

- Power supply
- Additional materials for the self-induction experiment

At cornelsen-experimenta.de you can find the following corresponding products:

54076	Supplementary set for 54075
	contains: light bulbs E10 / 6V / 0,3A (2x), bulbholders E10 (2x), LED with resistor, lever switch, resistor 20 Ohms
	or
23410	Class set Electrics 2.0 basic circuits for 4mm-plug-breadboard

55222	Power supply 2-12V/3A
	or
54985	Professional digital multimeter
	or
54961	Digital voltmeter for students 20V DC
	or
54962	Digital ammeter for students 10A DC

20402	Universal 4mm-plug-breadboard
	or
20406	Set of 6 universal 4mm-plug-breadboards

Age 13 – 18

Class set Magnetism 2.0

In 14 different stations your whole class can explore the elementary properties of magnetism as well as novel experiments in the field of dia- and paramagnetism. With the included checklist for students, all experimental results can be directly recorded and evaluated.

Learn more about physics at
cornelsen-experimenta.de/physik

All topics in one case:

- Elementary properties and interaction of magnets
- Magnetic properties of materials in everyday life
- Explaining magnetic phenomena with models
- NEW: Diamagnetism and paramagnetism (e.g. Moses effekt)
- Properties of magnetic fields
- The Earth's magnetic field and the compass

NEW

Included in delivery:

All experiments practicable on worksheets

Teacher's manual
- with copiable templates for each station

Pupils' Checklist
- for recording results at each station

Editable station cards online

49450	Materials for 14 workstations

Special equipment:

- **Neodymium magnets** for the exploration of dia- and paramagnetism (see picture below)
- Magnetic field model to demonstrate the properties of magnets (see picture above right)

Recommendes equipement:

- Electronic precision balance with an accuracy of 0,01 g
- (for station 7 "How can magnetism be weighed?")

At cornelsen-experimenta.de you can find the following corresponding products:

Electronic precision balance

Battery-powered balance including:

- adjustment program and adjustment weight
- quantity weighing function with selectable reference quantities (5, 10, 25 and 50)
- separate data storages for tare container and content
- durable dust and splash water protected housing
- stainless steel weighing plate
- batteries

Weighing range: 0.05 to 200g
readability: 0.01g
Weighing plate: Ø 105mm
Dimensions: 165 x 230 x 80mm

42061

Checklist "magnetism"

4945062 1 Checklist

4945066 10 Checklists

Age 13 – 18

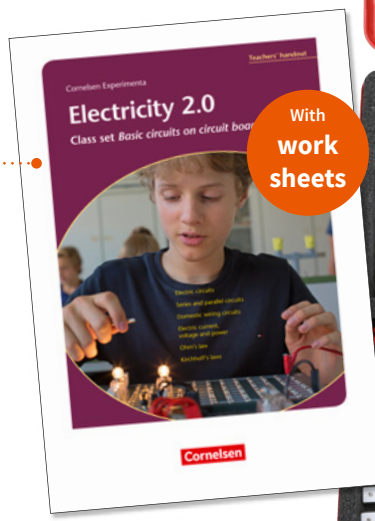
Class set Electricity 2.0 *Basic circuits for circuit boards*

6 groups of students
can experiment at the same time

Included in delivery:

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples



23410	Materials for 6 work groups

Experiments

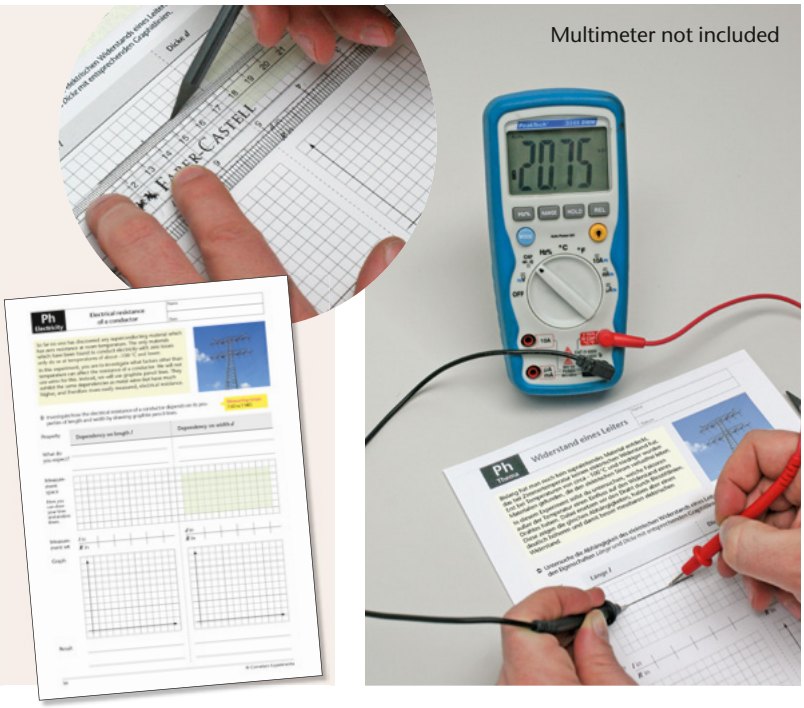
- Electric circuits
- Conductors and insulators
- Series and parallel lamp circuits
- Games with circuits
- Logic circuits
- Practical circuits
- Measurement of electric current
- Measurement of voltage
- Ohm's law
- Electrical resistance of a conductor
- Kirchhoff's laws
- Electrical power

Possibility to tie in with mathematics

$\overline{X}$

Statistics

Proportional correlation

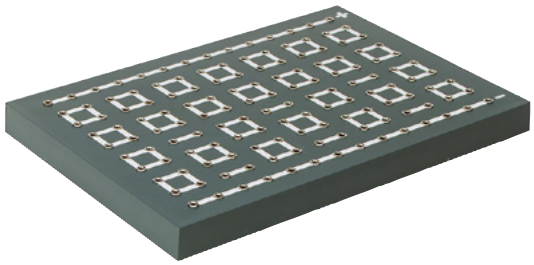


Students experiment Investigation of electrical resistance of a conductor with the help of graphite pencils

Separate inserts that can be individually removed

Additional circuit board required, e.g.:

20402 Universal circuit board



Additional power supply required, e.g.:

68533 Power supply unit 6 V (see page 79)

or

55222 Power supply unit, 12 V/3 A (see page 78)

Additional meter required, e.g.:

54985 Digital Multimeter with Bargraph (see page 81)

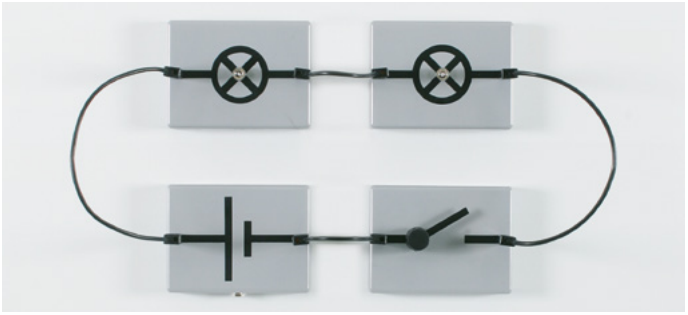
or

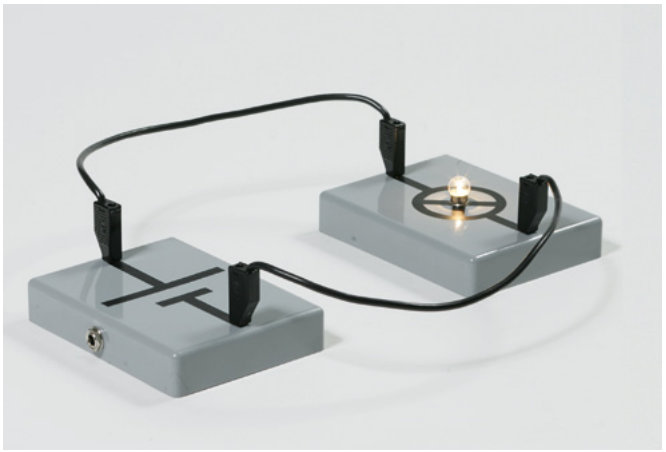
54892 Mini Digital Multimeter (see page 81)

Age 13 – 18

Students kit **Electricity** *Basic circuits*

This kit provides an easy way to carry out experiments on conduction and electrical circuits. Further experiments allow the effects of electric current and the functioning of electrical equipment to be investigated.





Detailed instructions for 12 experiments:

- Electric circuits
- Conductors and insulators
- Series and parallel lamp circuits
- Games with circuits
- Logic circuits
- Practical circuits
- Measurement of electric current
- Measurement of voltage
- Ohm's law
- Electrical resistance of a conductor
- Kirchhoff's laws
- Electrical power

Recommended for power supply in place of batteries:

68534 Power supply unit 3 V

Included in delivery:

Experiment description

53550 Materials for 1 work group

Age 13 – 16

Students kit Electrostatics

NEW

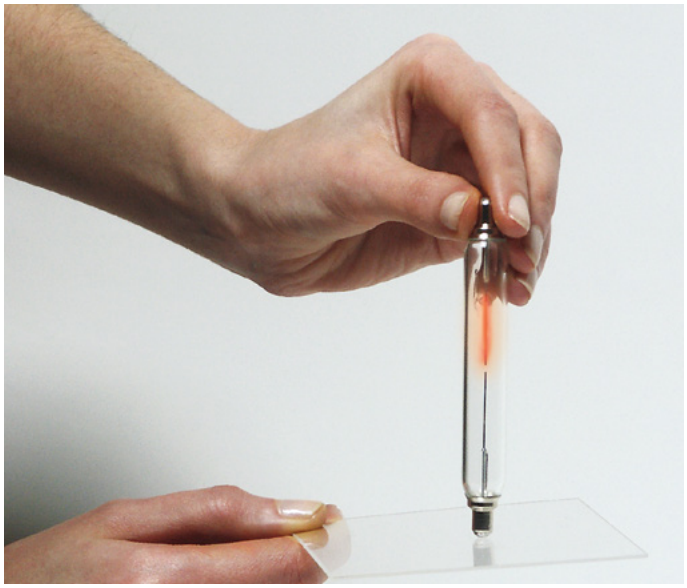
Topics:

- properties of the electric charge
- contact electricity
- polarisation and electrostatic induction
- electric field

Included in delivery:

Also included:

- Support card with instructions on how to use the electrostatic double pendulum, glow lamp and the triboelectric series (see picture on the left-hand side)
- extra large festoon lamp (see picture below)



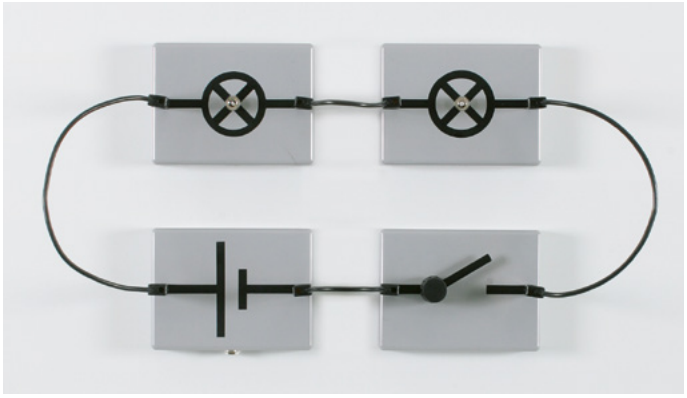
50000 Materials for 1 work group

Age 13 – 18

Students kit **Electrical circuits** *for the steel board*

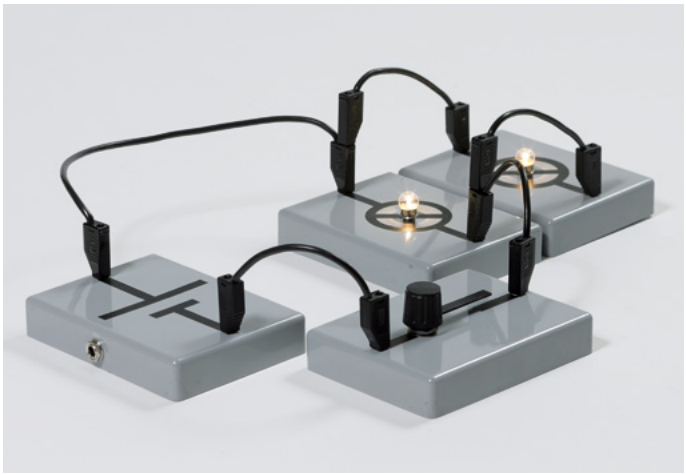
The bases for components are magnetically attachable and the top is printed with the relevant circuit symbol and wiring. They can either be placed horizontally on a bench or attached vertically to a steel board.

The electrical components are mounted inside an open socket but are not visible from above. All the bases are equipped with 4-mm sockets. The power supply component is equipped with a battery compartment for two AA (Mignon) batteries and a low-voltage socket for alternative connection of plug-in power supply *68534*.



Detailed instructions for 7 experiments:

- Simple circuit with lamp
- Circuit with lamp and switch
- Series/Parallel circuit with two lamps
- Electrical conductors and non-conductors
- Logic AND
- Logic OR



Recommended for power supply in place of batteries:

68534 Power supply unit 3 V (see page 79)

Included in delivery:

Experiment description

53540 Materials for 1 work group or demonstration

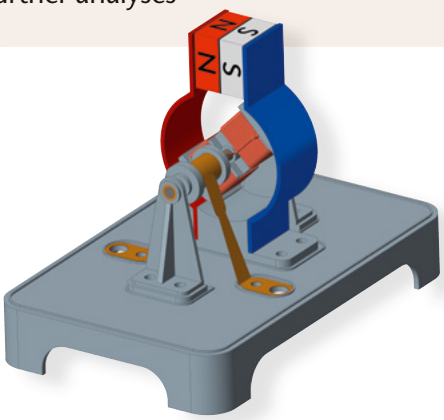
Age 13 – 18

Students kit Electro motor

The electro motor is designed of sturdy material. The commutation of the current is ensured by a commutator (not stripped enameled copper wire). Students can themselves assemble and dissemble the motor.

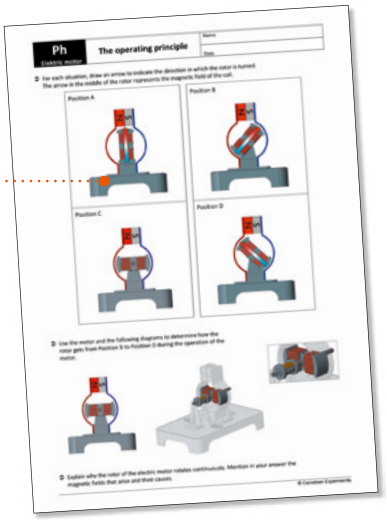
The product includes worksheets with proposed solutions on the topics:

- construction and components
- functioning
- further analyses



Included in delivery:

Student worksheets



54835	Materials for 1 work group

Back again

Age 13 – 18

Students kit Electronics

This kit contains all the components and equipment necessary for carrying out experiments on the function and behaviour of electronic components and circuits.

This means that all the basic properties of semiconductor components can be determined in individual experiments. In addition, countless experiments are possible on the interaction between electronic components in standard electronic circuits as well as in practical applications.

One set-up makes it possible to do experiments on the transmission of voice and music by means of light.

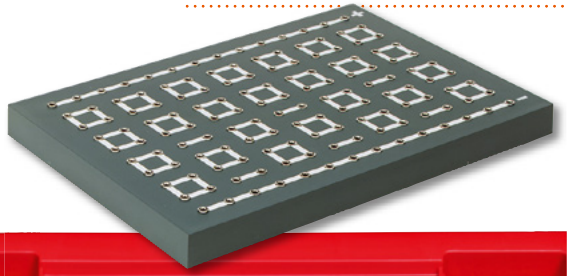
Required for setting up experiments:
Universal circuit board
(included in *20415*)

Additional power supply required, e.g.:

68533 Power supply unit 6 V (see page 79)

Additional meter required, e.g.:

54892 Mini Digital Multimeter (see page 81)



Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

20415	**Kit "*Electronics*" including circuit board**	Materials for 1 work group
20410	**Kit "*Electronics*" without circuit board**	Materials for 1 work group
20402	**Universal circuit board**	

Detailed instructions for 47 experiments:

- Diode
  - basic wiring
  - characteristic curve
  - behaving as a rectifier
- LED – basic wiring
- Voltage divider
- Bridge circuit
- NTC thermistor
- PTC thermistor
- Photoresistor
- Transistor
  - characteristic curve
  - behaving as a switch; amplifier; variable resistor
- Common emitter transistor circuit
- Common collector transistor circuit
- Photoelectric control (2 experiments)
- Light barrier
  - switching when illuminated; ... when not illuminated
- Twilight switch
- Short-delay switch
- Long-delay switch
- Temperature control
  - using NTC thermistor
  - using PTC thermistor
- Temperature monitor
  - using NTC thermistor
  - using PTC thermistor
- Flashing unit
- Schmitt trigger
- Moisture switch
- Dryness switch
- Differential amplifier
- Astable multivibrator
- Monostable multivibrator
- Bistable multivibrator
- AND gate
- OR gate
- NAND gate
- Field effect transistor: principle; demonstration of electric charge
  - basic wiring
  - input resistance
  - characteristic curve
- Opto-electronics using field effect transistors (2 experiments)
- Flip flop circuit using field effect transistors
- Using light to transmit music, transmitter and receiver

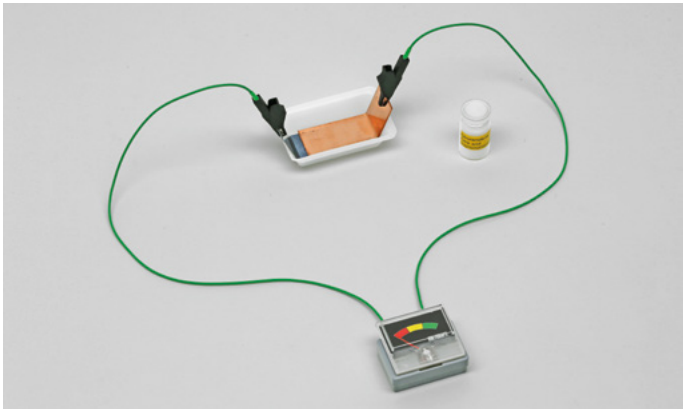
Age 13 – 18

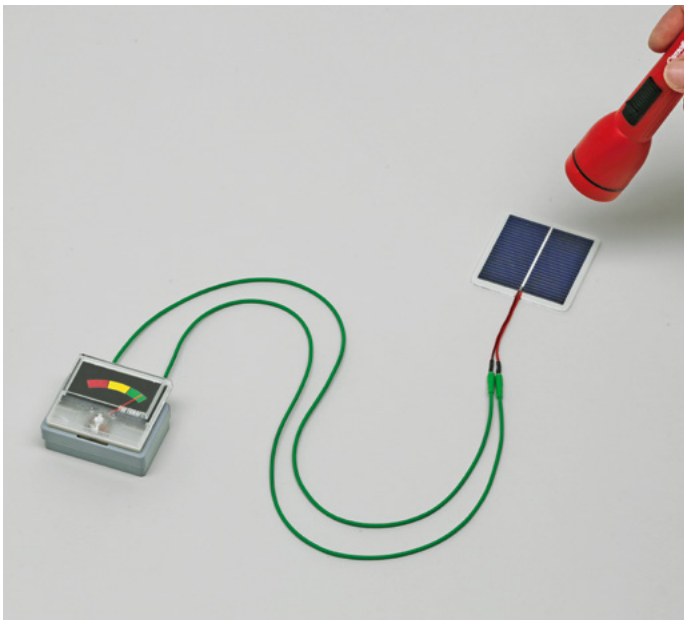
Students kit Electrical energy sources

For school experiments involving sources of electrical energy, which can be carried out within the time frame of a single lesson.

The equipment is designed to be particularly simple and easy to understand and can be handled with ease by groups of pupils in the first year of secondary school.

As an indication of the electrical energy generated a voltage indicator is provided.





Included in delivery:

Experiment description

The principles of electrical generation from the following sources can be illustrated:

- Radiant energy – solar cell
- Chemical energy – galvanic cell
- Mechanical energy – induction coil

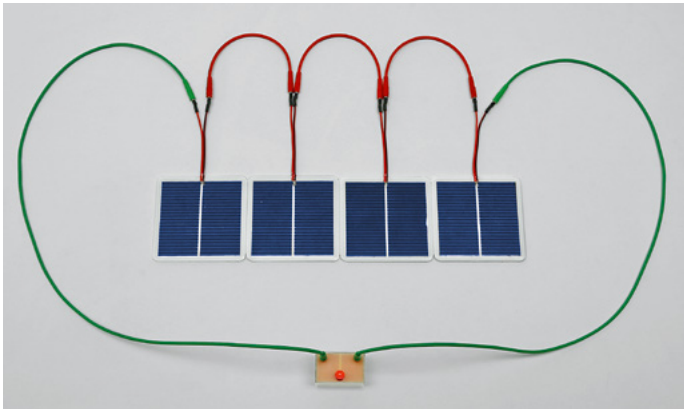
23030 Materials for 1 work group

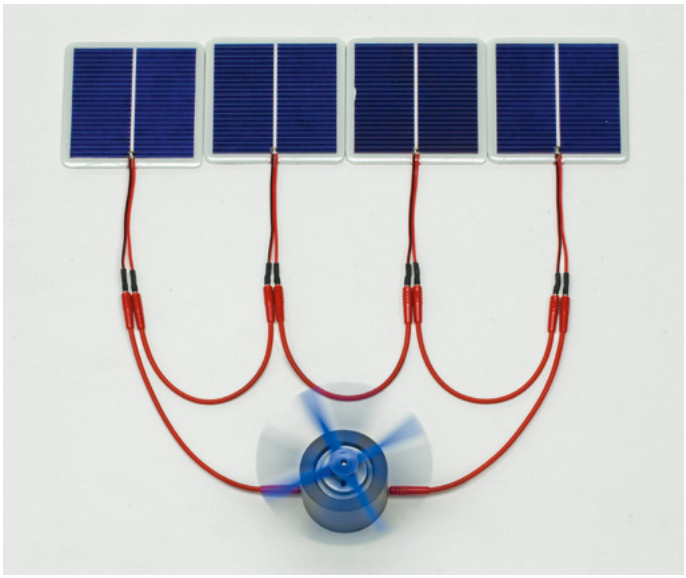
Age 13 – 18

Students kit **Solar cell**

For school experiments using solar cells, which can be carried out within the time frame of a single lesson.

The various elements are designed to be particularly simple and easy to understand and can be handled with ease by groups of pupils. No other equipment is necessary except for the provision of additional sources of light to illuminate the solar cells at times of year when there is less sunlight available, along with simple school measuring instruments to measure electrical quantities.





The experiments that can be carried out include the following:

- No-load voltage and short-circuit current
- Series- and parallel connection
- Power characteristic line of a solar generator
- Influence of illuminance and of the illumination angle
- Conversion of solar energy to mechanical energy and to luminous energy
- Solar production of hydrogen

Additionally required:

47100	Reflector lamp
15670	Tripod stand plate with socket and screw

Included in delivery:

Experiment description

23060	Materials for 1 work group

Age 13 – 18

Students kit Fundamental physics

The equipment in this kit makes it possible to conduct 96 fundamental experiments on the topics of *mechanics, energy, heat, acoustics, optics* and *electricity*. The key focus is on understanding the effects of physical laws and the precise measurement of physical quantities.

The selection of individual components has been made under the consideration that they can be used in as many functions as possible.

The experiments can be set up with the help of the clear experiment instructions in such a way that they are guaranteed to function properly.

No additional materials or equipment are necessary. The equipment in the kit can also be used outside a laboratory.

Included in delivery:

Experiment description

16005	Materials for 1 work group or demonstration

Detailed instructions for 96 experiments for the following topics:

Mechanics of solid bodies
- 17 Experiments

Mechanics of fluids
- 11 Experiments

Mechanics of gases
- 10 Experiments

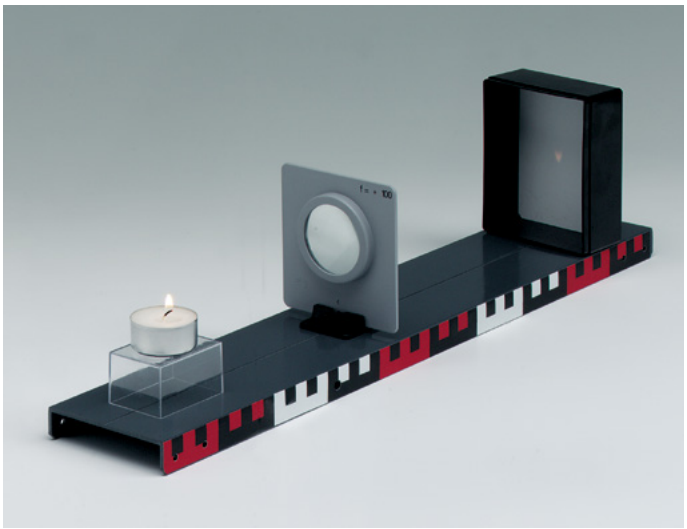
Heat
- 9 Experiments

Sound
- 5 Experiments

Light
- 16 Experiments

Magnetism
- 8 Experiments

Electricity
- 20 Experiments



Demo

Demonstration kit Physics

A very important basis for a profound and successful physics lesson is the demonstration of experiments. Even if your school is not equipped with a special science lab you need not refrain from this advantage.

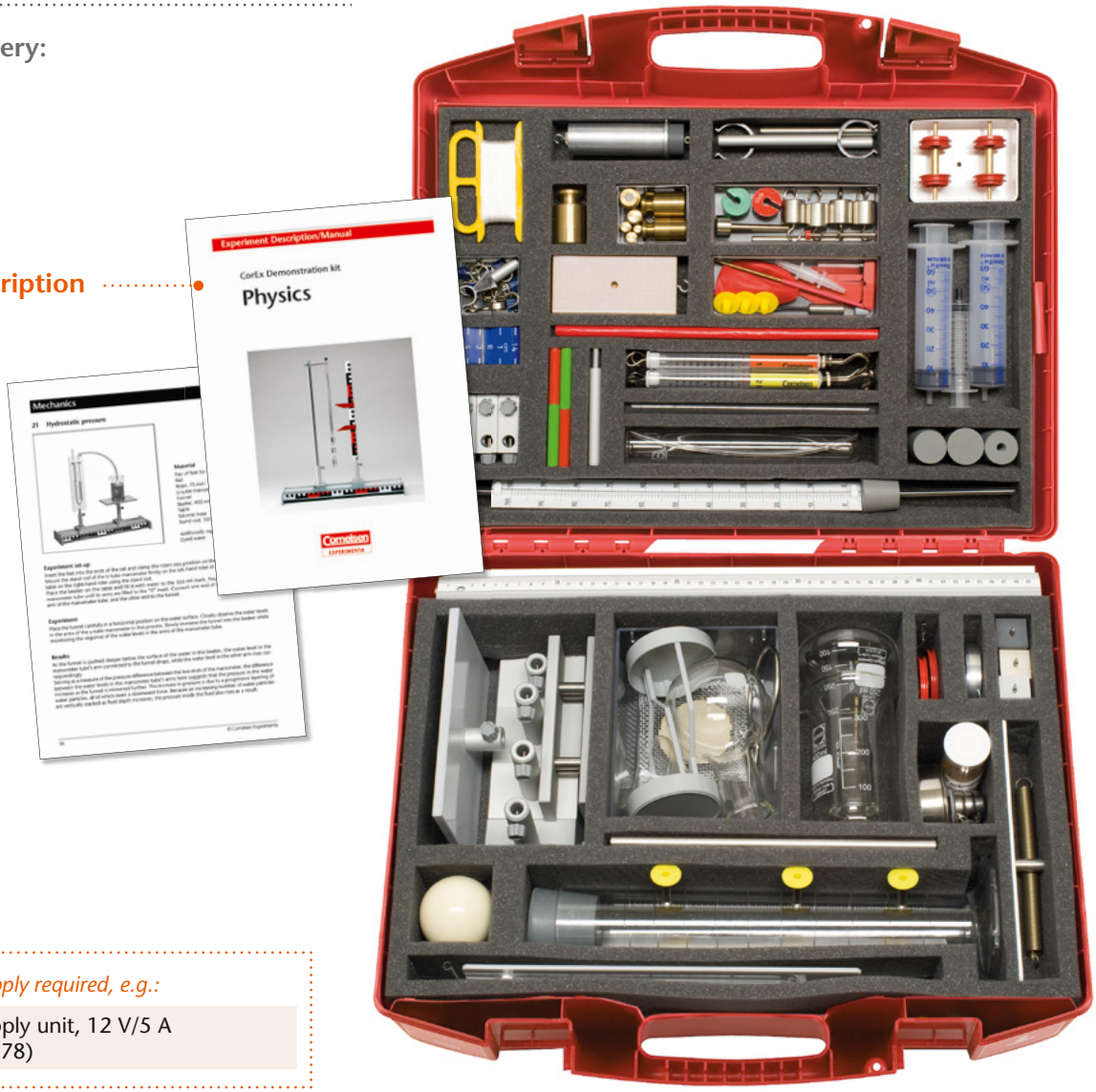
The kit contains all the required materials, which are used to carry out the most important experiments which form the fundamentals of Physics. The stable and universal design of all parts allows a secure experimenting and guarantees a long durability.

No additional equipment is required for the execution of the experiments which can be carried out at any place and under nearly every climatic condition. Only for the demonstrations in the field of electricity a simple power supply is required in addition.

The parts are compatible with the other parts of our program, so that the kit can always be supplemented.

Included in delivery:

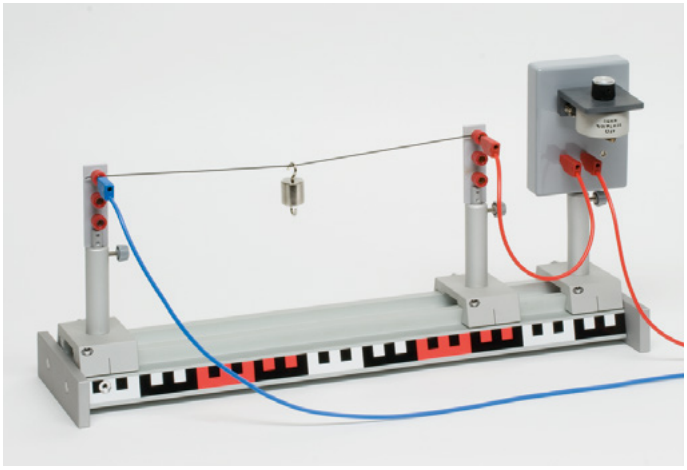
Experiment description

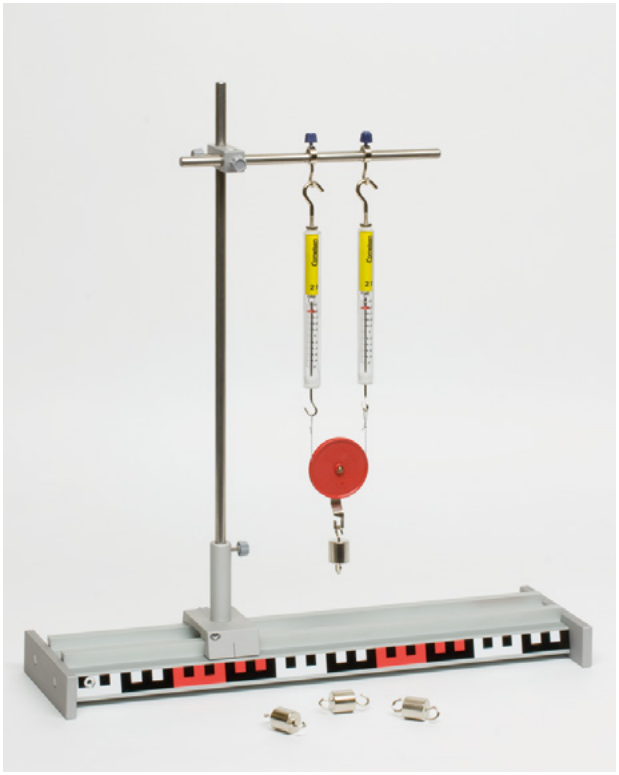


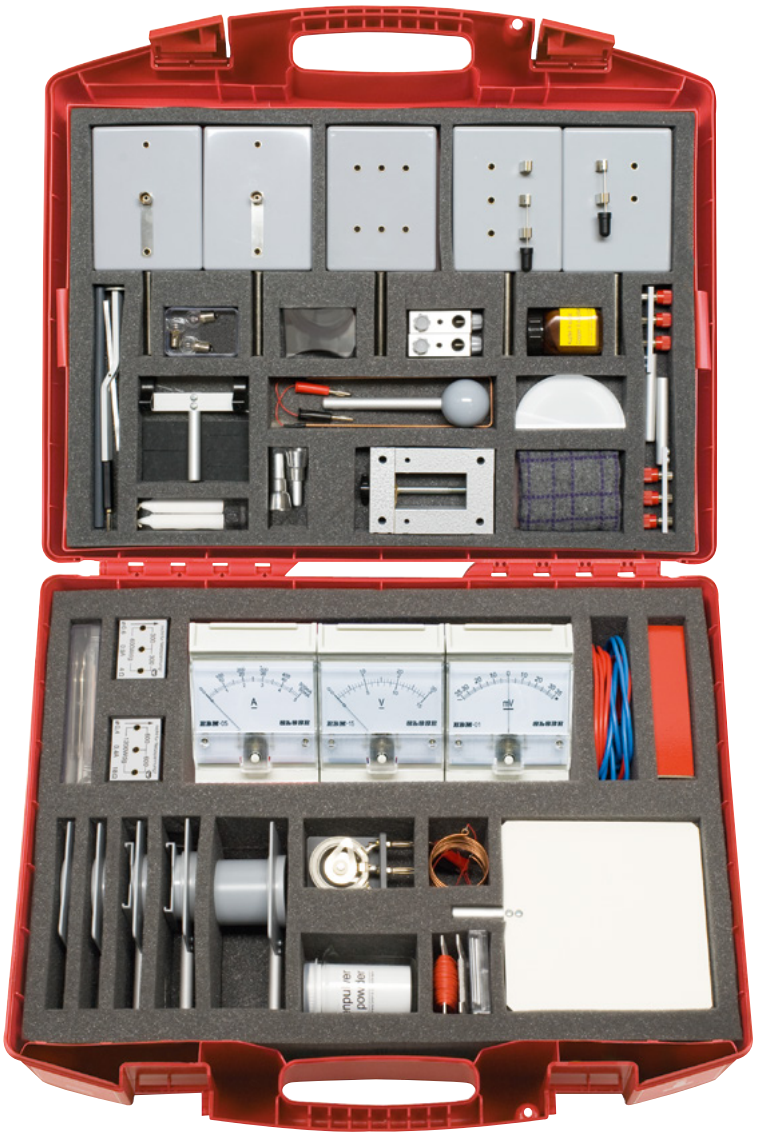
Additional power supply required, e.g.:

55262 Power supply unit, 12 V/5 A
(see page 78)

16500 Materials for 1 work group or demonstration

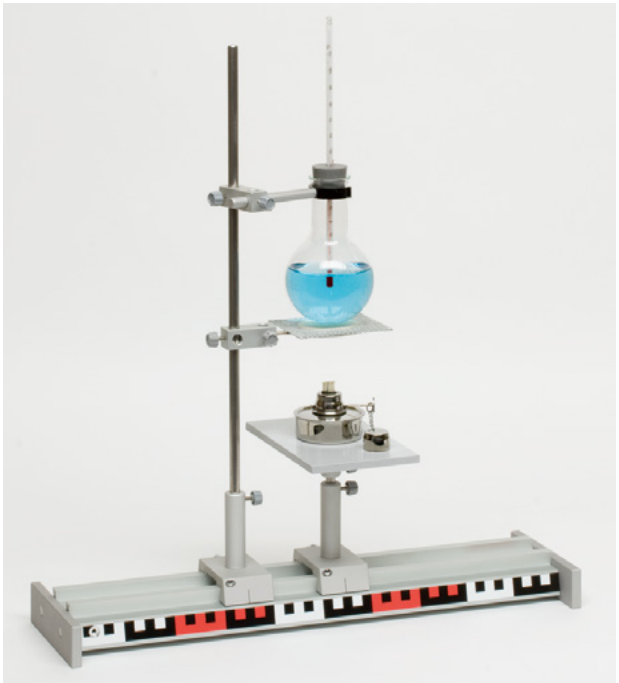






Detailed instructions for 74 experiments:

- Mechanics (31 experiments):
- Heat (7 experiments):
- Optics (8 experiments):
- Electricity (28 experiments):

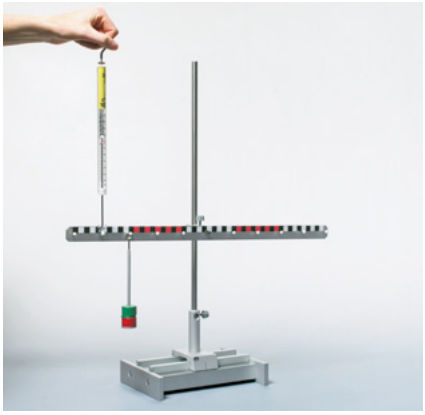


Demo

Demonstration kit **Mechanics**

For the demonstration of various laws of mechanics with levers, pulleys, pulley blocks and dynamometers.

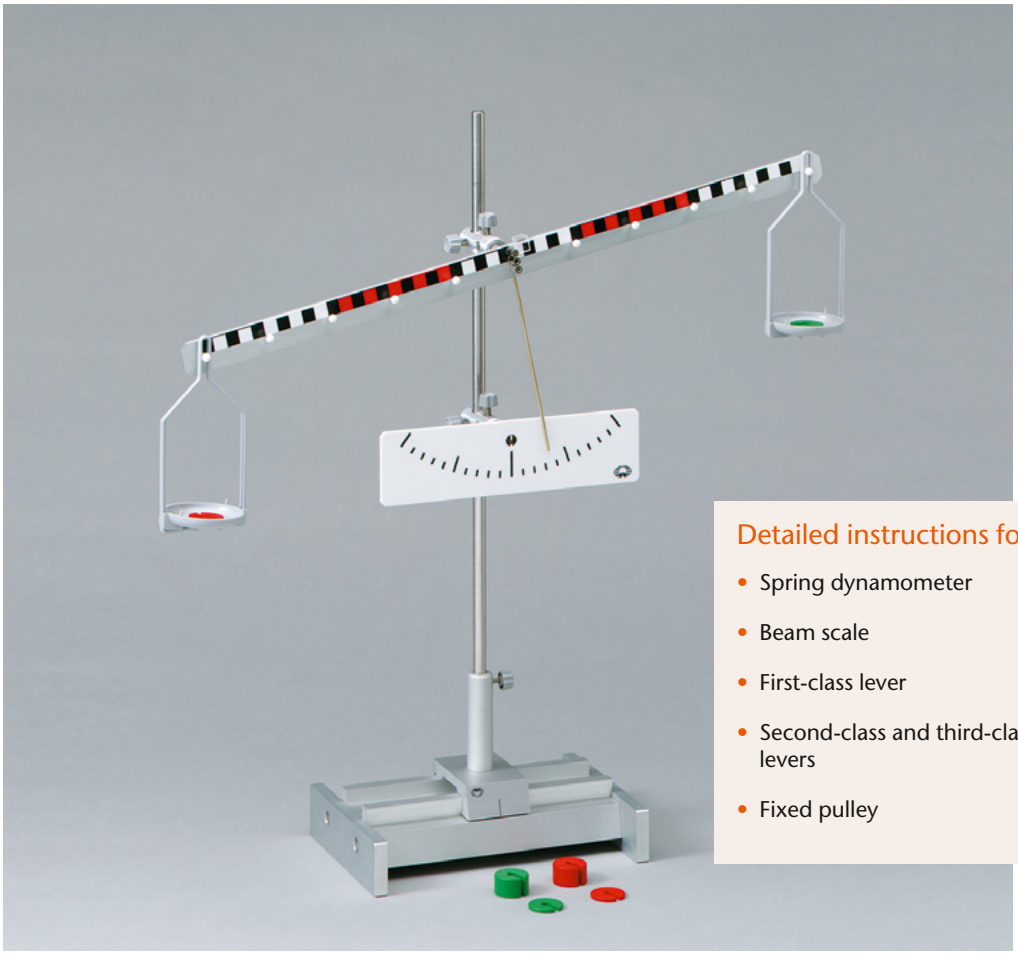
The experimental setup and the execution of the experiments can be done without any additional equipment in every classroom.



Included in delivery:

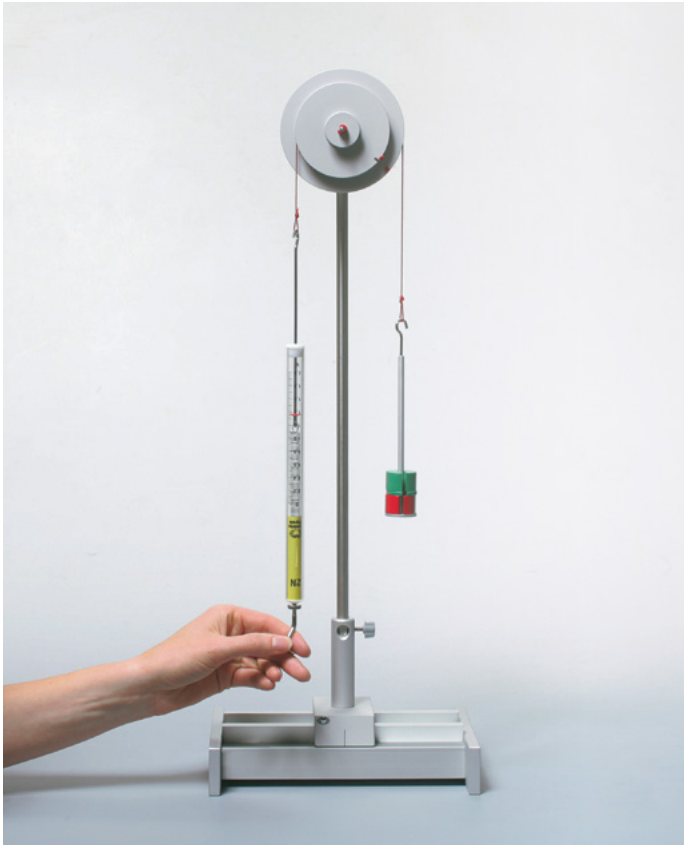
Experiment description

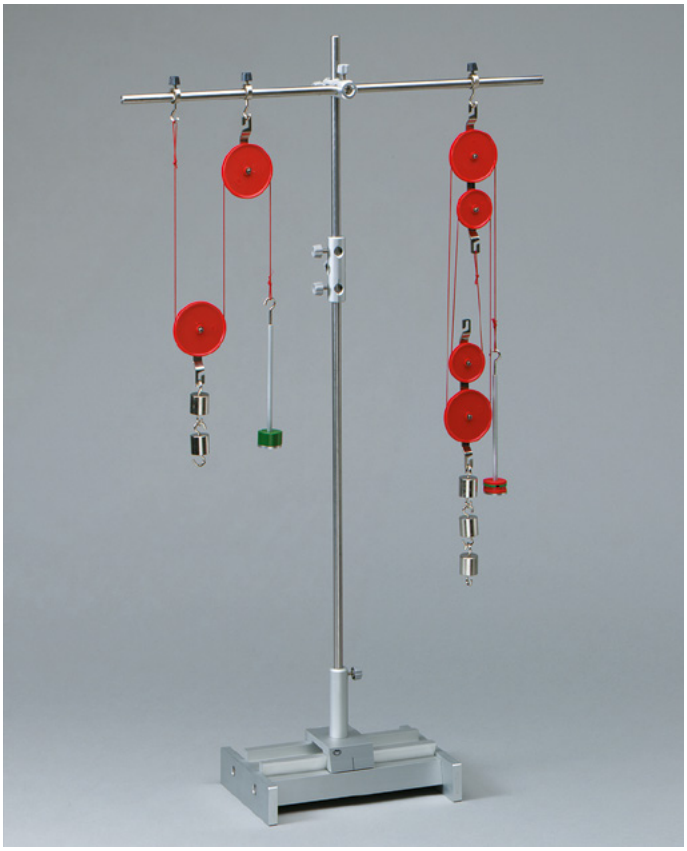
43080	Materials for demonstration



Detailed instructions for 10 experiments:

- Spring dynamometer
- Beam scale
- First-class lever
- Second-class and third-class levers
- Fixed pulley
- Moveable pulley
- Fixed and moveable pulley
- Pulley block (2 experiments)
- Multiple diameter pulley

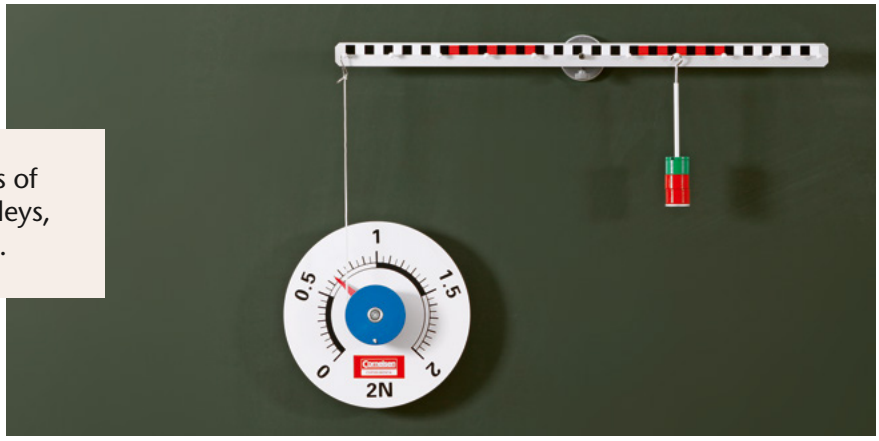




Demo

Demonstration kit **Mechanics** *for the steel board*

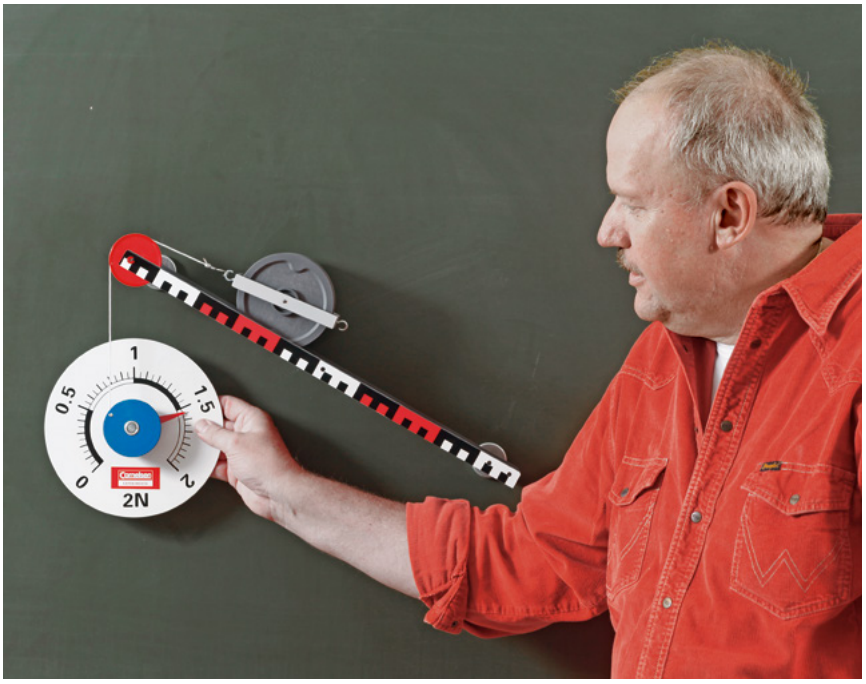
For the demonstration of the basic laws of mechanics and simple machines as pulleys, pulley blocks, levers and inclined plane.

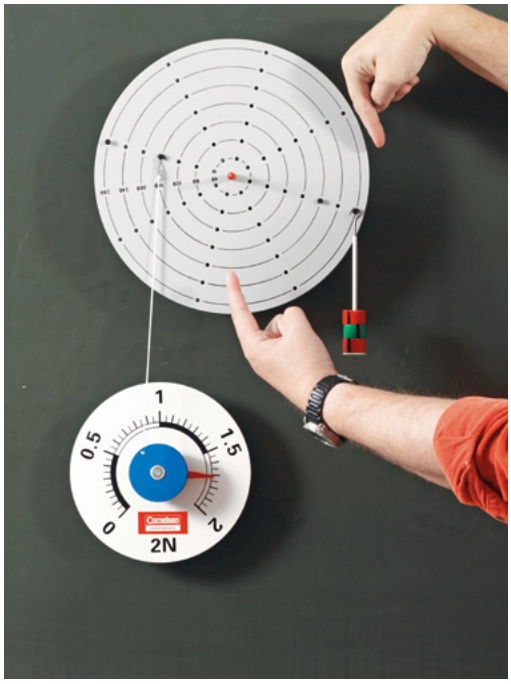


Included in delivery:

Experiment description

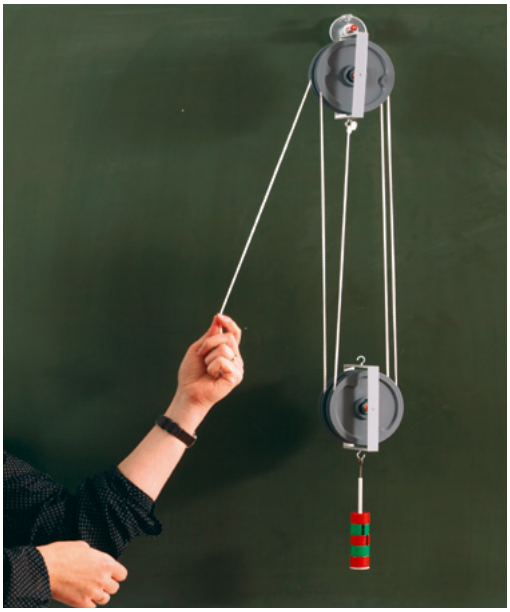
43085	Materials for demonstration

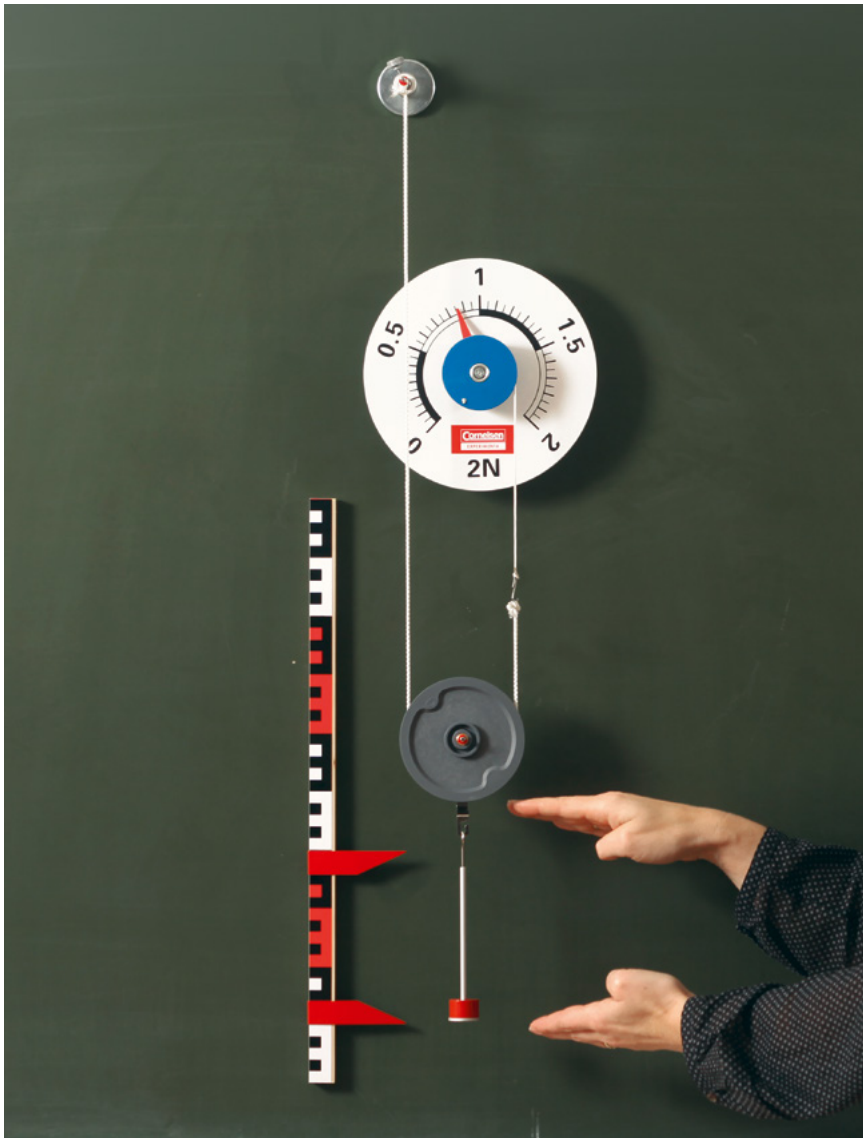




Detailed instructions for 15 experiments:

- Mass and weight force
- Hooke's law
- Force and counterforce
- Composition / Decomposition of forces
- Inclined plane
- Location of centre of gravity
- 1st class lever
- 2nd class/3rd class levers
- Torque
- Beam scale
- Fixed/Moveable pulley
- Fixed and moveable pulley
- Block and tackle





Demo

Demonstration kit Dynamics 2.0

The kit contains equipment and resources required for demonstrating the basic laws of motion and oscillation. A digital timer is included to support the efficiency of experimenting.

Measurements can be made in a conventional manner irrespective of the power supply, but can also analyse the saved results on a PC later on. In addition, the timer can be used as an interface, allowing any measurement to be displayed, processed and saved on a PC or notebook computer.

The measurements are recorded by means of accurate and reliable light barriers. The precisely manufactured carriage with its own propulsion is characterised by the extremely high precision of its movement.

Included in delivery:

Digital timer
V-Log

Exact measurement of
- Time
- Speed
- Acceleration
- Period of oscillation

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Complete evaluation of examples

4299588 Materials for demonstration

Included in delivery:

Detailed instructions for 15 experiments:

- Uniform motion in a straight line
- Newton's laws (2 experiments)
- Relationship between distance and time for uniformly accelerating motion
- Motion plots
- Free fall:
  - Acceleration due to gravity
  - Height of fall – speed of fall
  - Height of fall – time to fall
- Trajectory of horizontally launched projectiles
- String pendulums
  - Period of oscillation
  - Damping
  - Determination of *g*
- Conservation of momentum
- Elastic and inelastic collisions

Demo

Demonstration kit **Flight and flying**

The kit contains apparatus and resources for demonstrating the fundamental processes and relationships which make flying possible due to static or dynamic lift and by reaction engines.

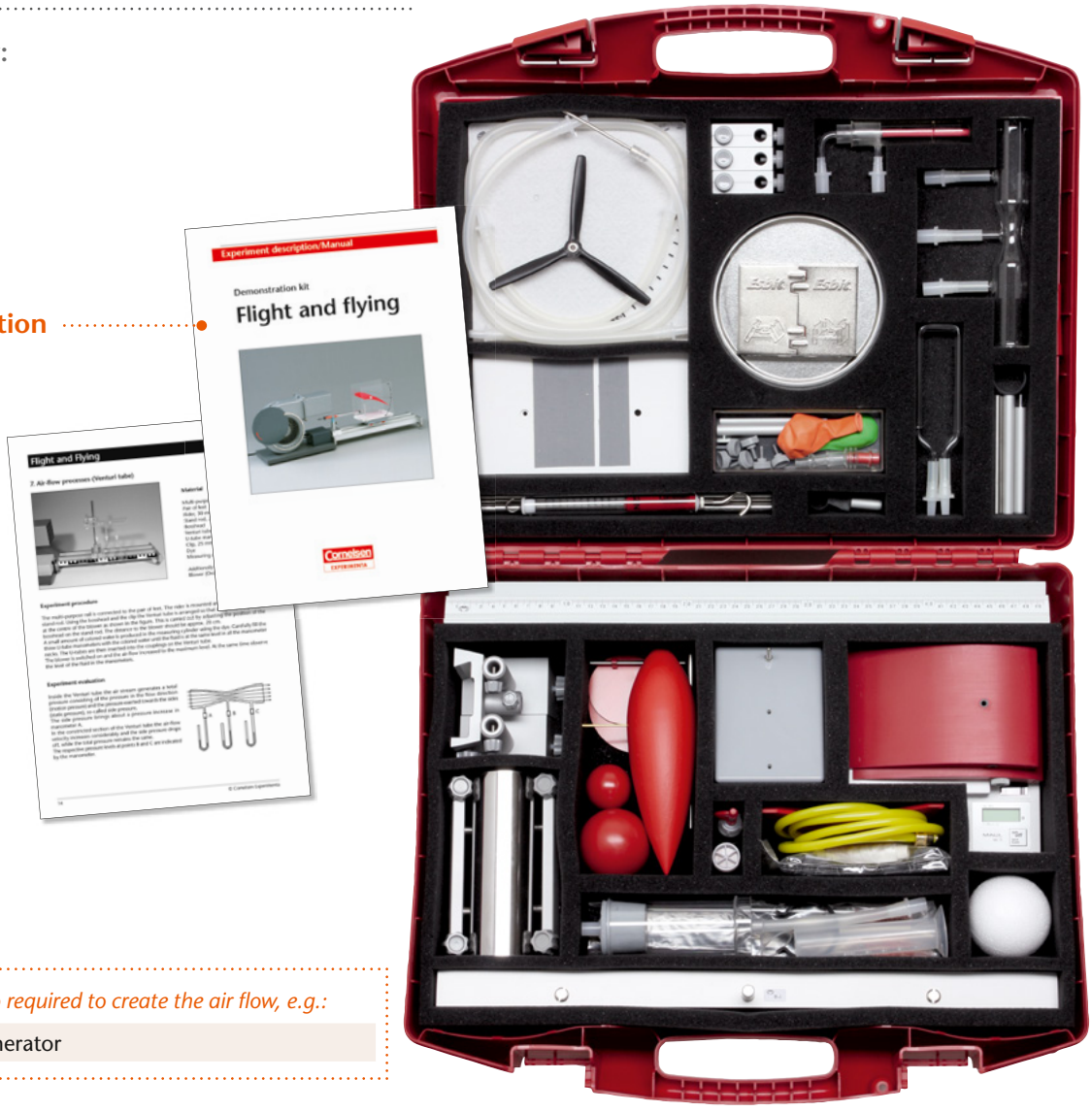
Using a hot-air balloon as an example, it is possible to impressively yet simply explain and illustrate that particular form of flight.

The response of differently shaped bodies in the presence of a flow of air is investigated using various experiment set-ups, and thereby a more detailed understanding of the pressure and air resistance arising can be gained.

A model rocket can be used to demonstrate how rockets fly even without the presence of an atmosphere.

Included in delivery:

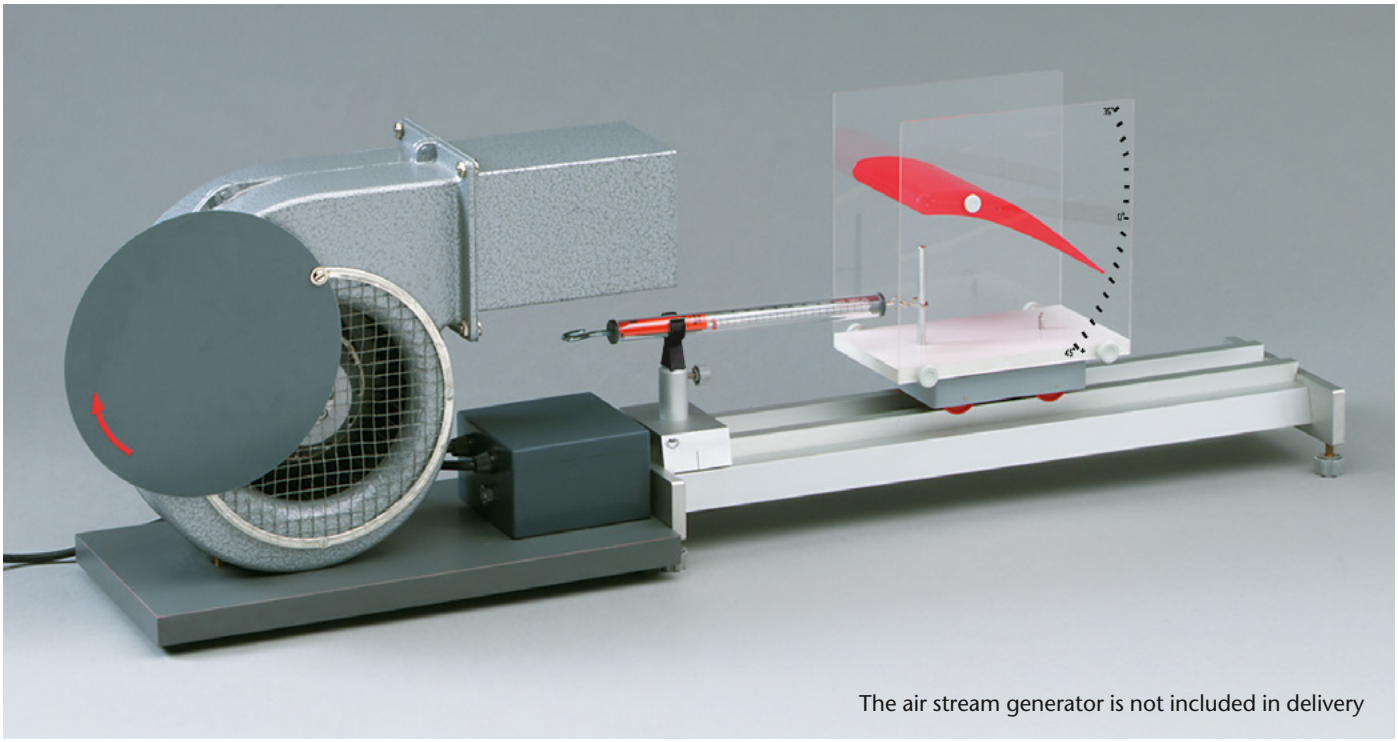
Experiment description



Air stream generator also required to create the air flow, e.g.:

29010 Air stream generator

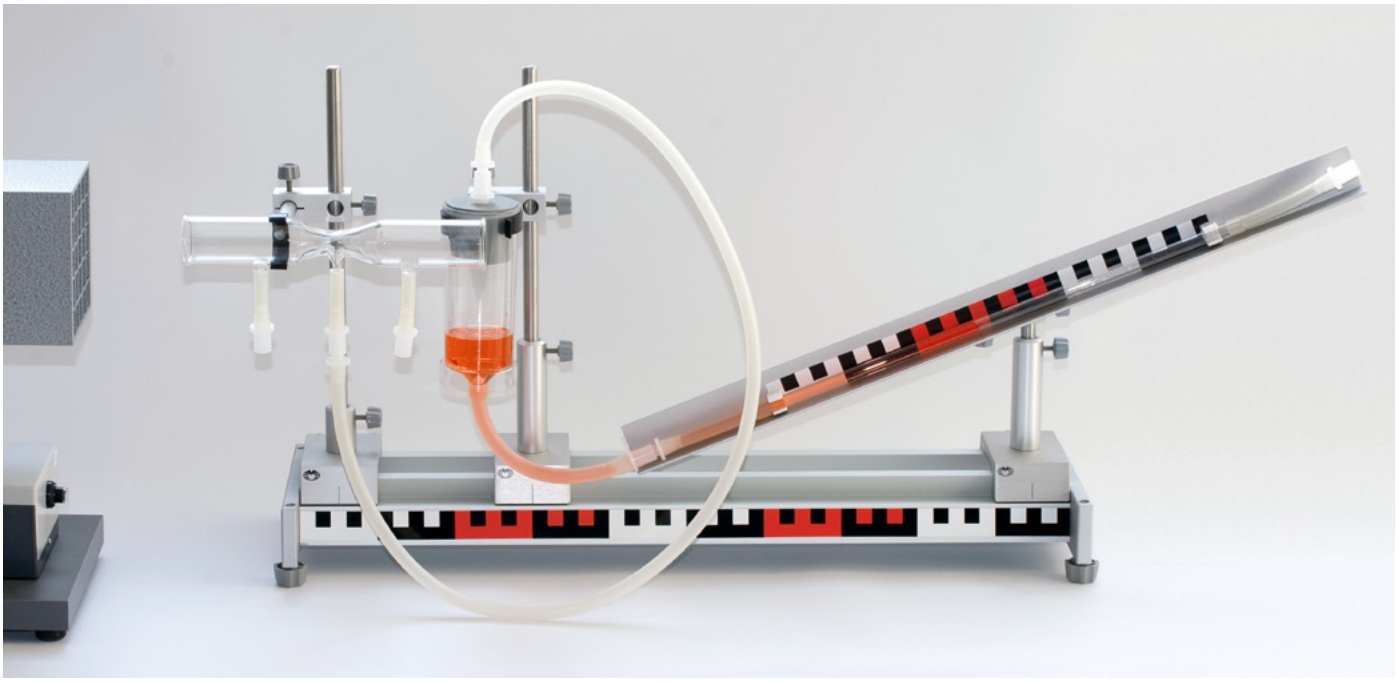
29008 Materials for demonstration



The air stream generator is not included in delivery

Detailed instructions for 25 experiments:

- Static lifting power
  – hot air balloon
  – solar balloon
- Forces exerted by air stream
- Dynamic lifting power
- Air-flow velocity
- Air-flow processes (Venturi tube)
- Principle of the inclined tube manometer
- Measuring the flow velocity
- Principle of the Pitot tube
- Pressure differences at the air foil
- Pressure distribution along the surface of the air foil
- Measuring the dynamic lift
- Air-stream distribution around the air foil
- Air resistance and shapes of bodies
- Measuring the air-stream resistance
- Flow processes at obstacles
- Eddy formation behind a disc
- Pull of an impeller
- Principle of an autogiro
- Mechanism of a rotary wing
- Reaction principle
- Functional model of a rocket



Demo

Demonstration kit **Wind energy**

This kit contains apparatus for carrying out fundamental experiments on the use of wind energy.

Use of wind energy has now become well established as a well known means of converting energy. The kinetic energy of wind is being used more and more often as an alternative source of energy by converting it into mechanical energy and then into electrical energy.

This kit allows to investigate the possibilities and limitations of a simple wind generator. The effects of various factors such as the type of rotor, the wind speed, the wind direction and others can be compared and evaluated. In order to create the requisite flow of air, a simple fan is used.

Included in delivery:

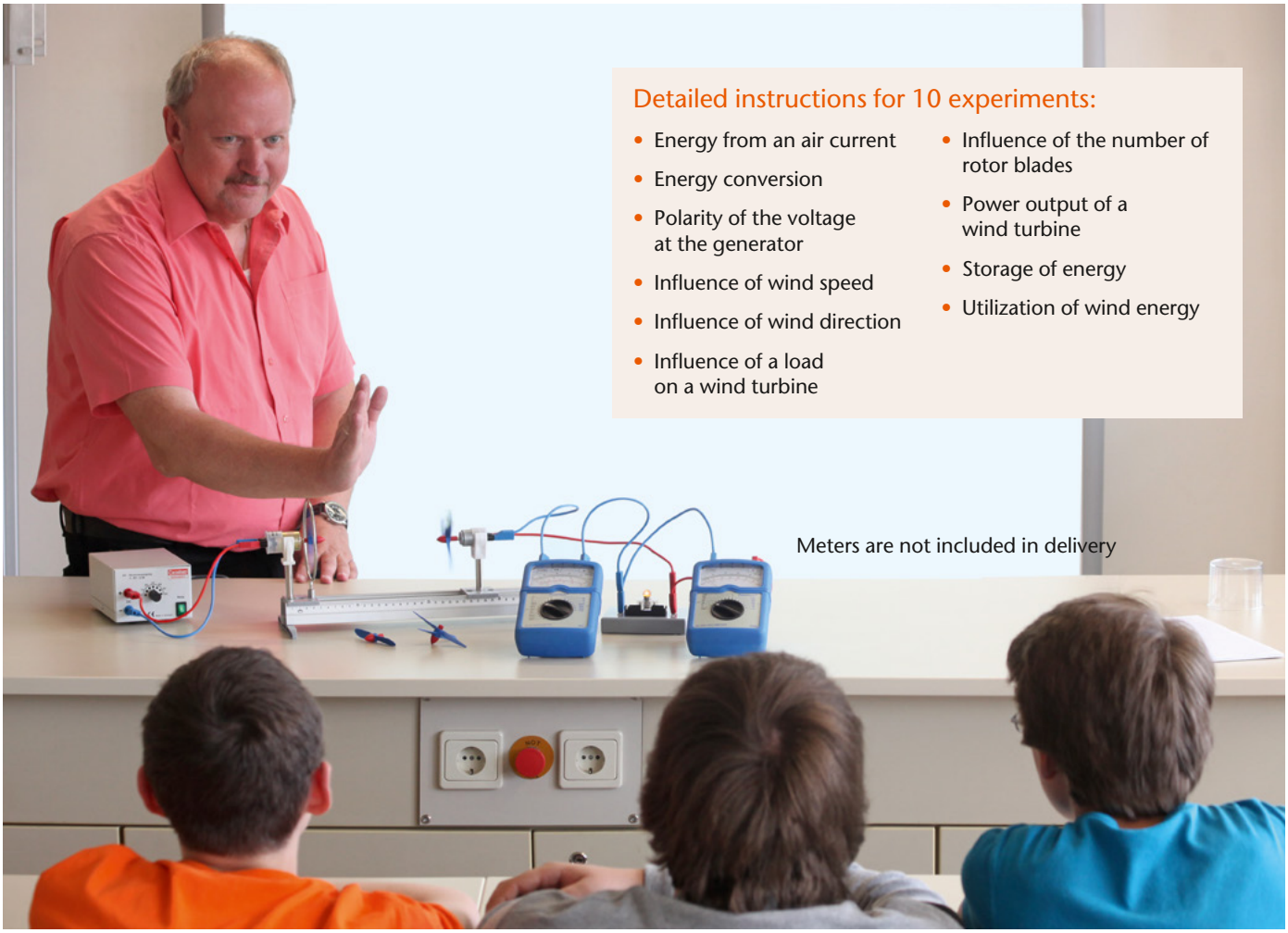
Experiment description

Renewable Energies

Meters additionally required, e.g.:

54985	Digital Multimeter with Bargraph (see page 81)
	or
54870	Analogue Multimeter (see page 80)

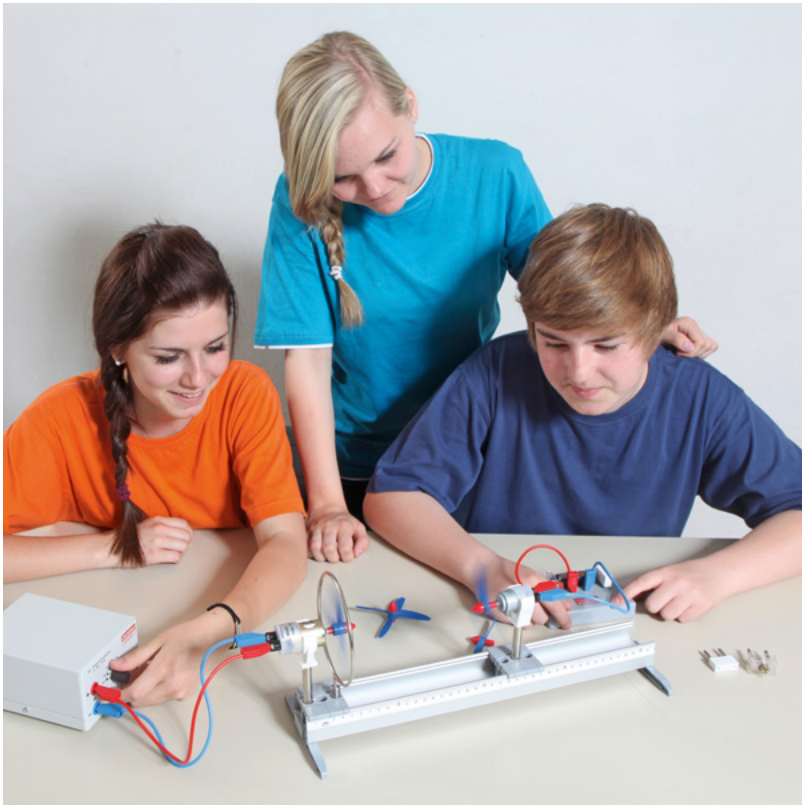
54620	Materials for demonstration

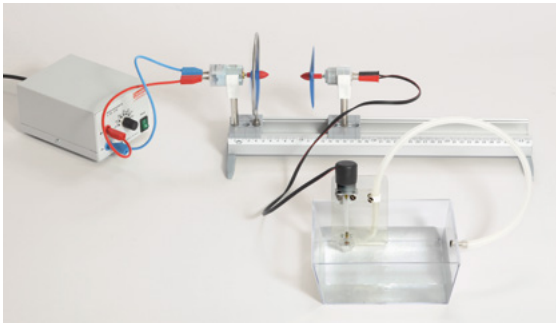


Detailed instructions for 10 experiments:

- Energy from an air current
- Energy conversion
- Polarity of the voltage at the generator
- Influence of wind speed
- Influence of wind direction
- Influence of a load on a wind turbine
- Influence of the number of rotor blades
- Power output of a wind turbine
- Storage of energy
- Utilization of wind energy

Meters are not included in delivery



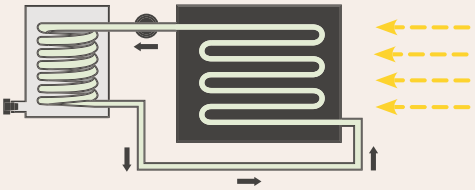


Demo

Demonstration kit Solar thermal energy conversion

For demonstrating the fundamentals and technical applications of solar thermal energy conversion.

This kit contains apparatus for basic experiments on heat absorption, convection and radiation, as well as allowing the assembly of a complete solar collector with thermal siphon recirculation, pump circulation and heat exchanger.



The solar collector ...

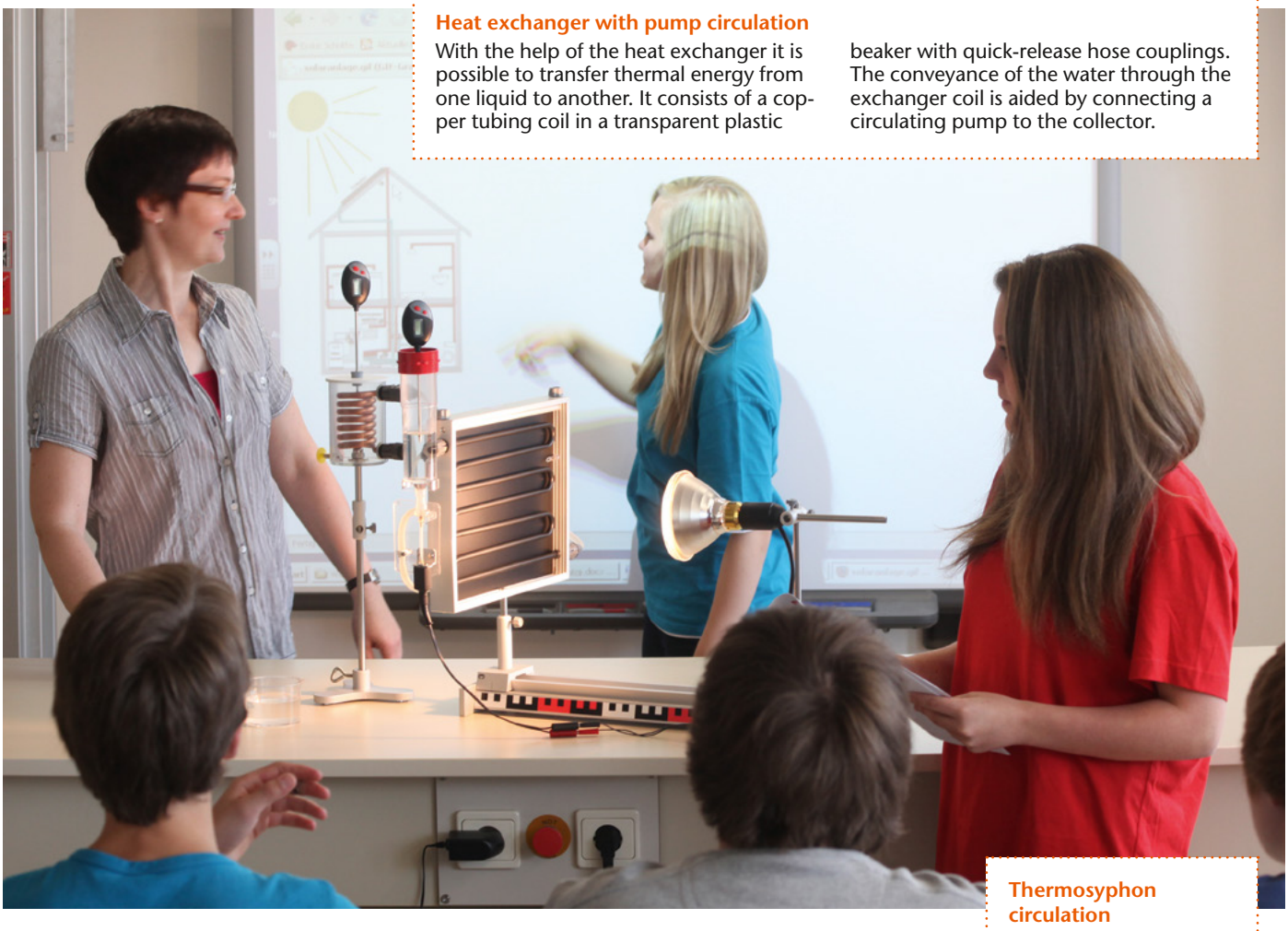
- converts energy radiated by the sun into heat using water to convey the energy. After shining the light on the collector for several minutes, it is possible to measure a distinct rise in temperature.
- is used in conjunction with the included reflector projector, which acts as the source of energy.
- has two removable front panes of glass to prevent convection losses.
- has a blackened collector spiral with six loops and two connectors for rapid release hose couplings.
- has interchangeable black and white painted rear covers, expanded polystyrene insulation and a removable plexiglass pane at the rear.

Included in delivery:

Experiment description

Renewable Energies

49355	Materials for demonstration



Heat exchanger with pump circulation

With the help of the heat exchanger it is possible to transfer thermal energy from one liquid to another. It consists of a copper tubing coil in a transparent plastic beaker with quick-release hose couplings. The conveyance of the water through the exchanger coil is aided by connecting a circulating pump to the collector.

Detailed instructions for 6 experiments:

- Heat radiation
- Absorption of heat radiation
- Heat convection
- Principle of the solar collector
- Solar collector with thermosyphon circulation
- Solar collector with pump circulation and heat exchange

Thermosyphon circulation

If the elevated tank is connected via the supplied hoses to the solar collector, there will arise a difference in density of the water dependent on the temperature which will cause convection to occur, thus circulating the water.

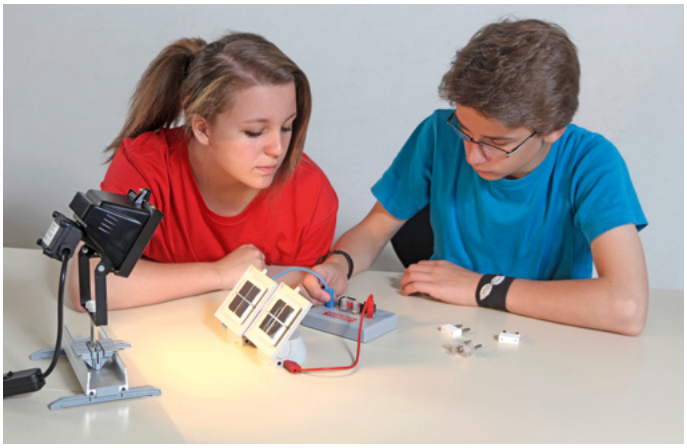
Demo

Demonstration kit Photovoltaics

Combining knowledge about the possible uses of renewable energy systems has now become a key component of general education curricula.

As ever, the sun with its virtually inexhaustible resources of energy is at the core of interest in general.

This kit contains all the equipment necessary for carrying out fundamental experiments on the recovery and use of electrical energy produced from sunlight.



Included in delivery:

Experiment description

Renewable Energies

49346	Materials for demonstration

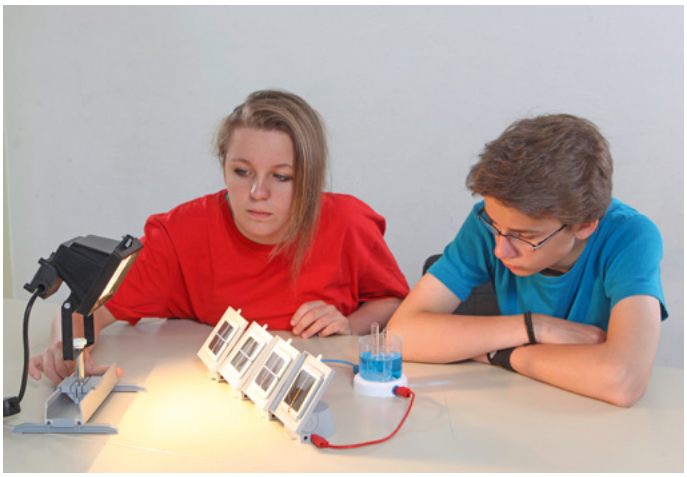
Detailed instructions for 14 experiments:

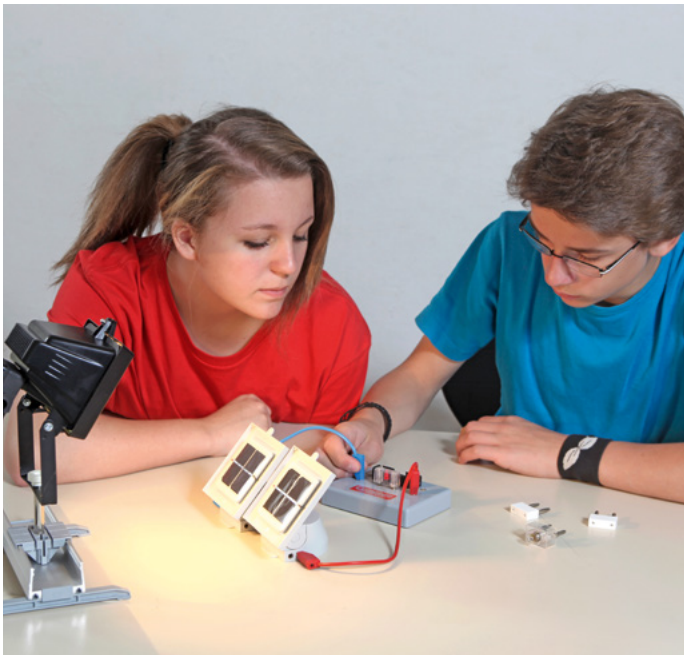
- Solar cell as a voltage source
- Solar cell as current source
- Internal resistance of the solar cell
- Solar cell as a diode
- Influence of illuminance
- Influence of the illumination angle
- Solar module
- Series connection of solar modules
- Parallel connection of solar modules
- Charging a solar battery
- Conversion of solar energy
  – into light energy
  – into mechanical energy
- Generating hydrogen with the help of solar energy
- Charging an accumulator with solar energy

Solar cell module 1V

Voltage: 1 V
Current: max. 300 mA
Size: 90 x 90 x 100 mm

Two solar cells, 0.5 V each, connected in series, mounted on base with hinged panel and 4 mm socket terminals. To increase voltage or current a number of solar cells can be connected in parallel or in series by means of the *Connecting Plugs 54583*.





Demo

Hydroelectric power plant

Attractive and easily understood model consisting of an impulse turbine and a 6-V, 3-W generator with a transparent end flap all assembled on a common shaft.

Built on a base board with circuit diagram and two pairs of 4-mm output sockets, one for AC and one for DC, used for connecting loads.

There is a choice of plugging an incandescent lamp or an electric motor with a propeller into the load sockets, each of which is on its own plug-in component.

Suitable hoses of 1 m in length are supplied with the equipment for the inlet and outlet of water.

Size: 240 x 175 x 200 mm

The hydroelectric power plant model can be used with water only, not with steam!

44631 Materials for demonstration

Demonstration set Surface tension

Demo

To determine the force which is necessary to tear off a ring which is placed on the surface of water.

The set contains:

- Tripod stand
- Stand rod, 500 mm
- Bosshead with slit
- Stand rod, 100 mm
- Rings with hook
- Dynamometer, 200 mN
- Surface tension ring
- Plastic pots with flow
- Silicone tube, 50 cm
- Supporting wooden blocks

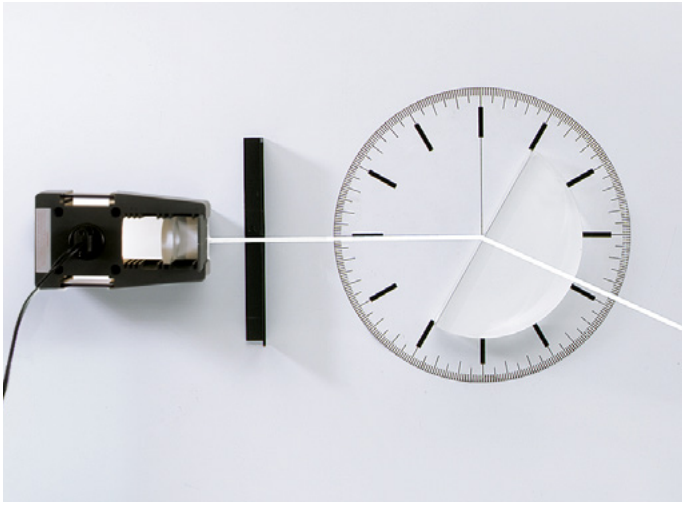
44075 Materials for demonstration

Demo

Demonstration kit **Optics** *for the steel board*

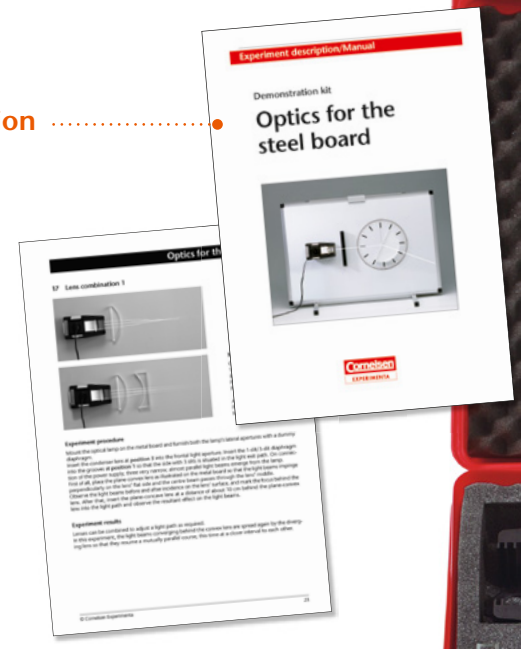
For investigating the path of rays through lenses, prisms and mirror models attached to a steel board.

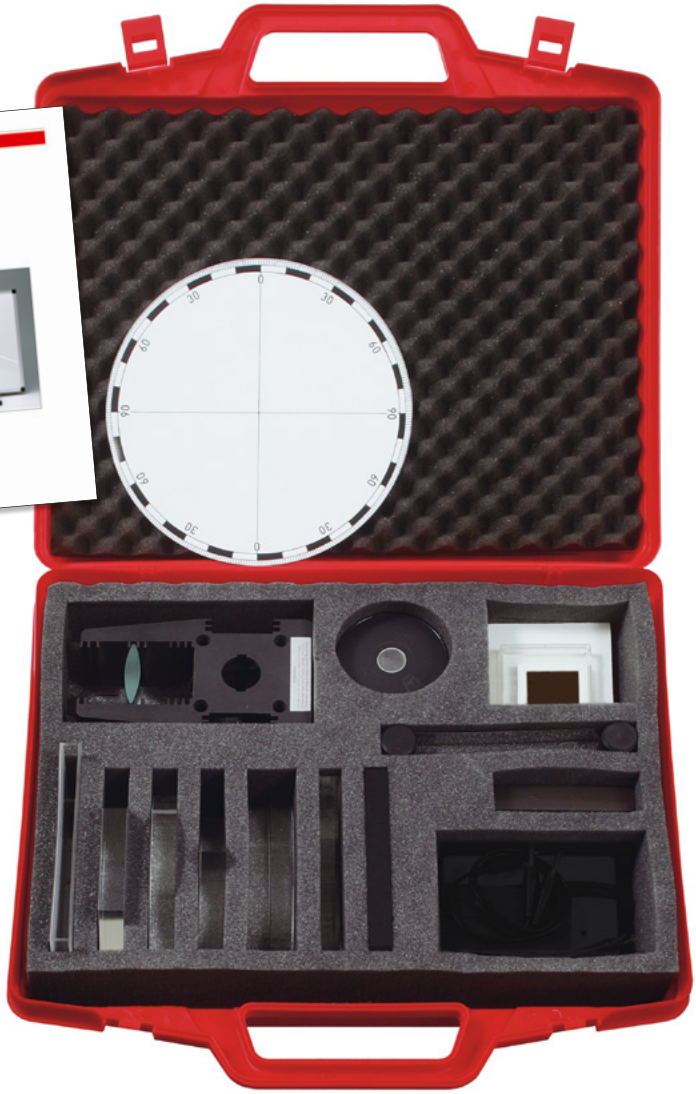
All the model bodies are made of transparent plexiglass with an attached magnetic foil and are 140 mm long, 15 mm thick.



Included in delivery:

Experiment description

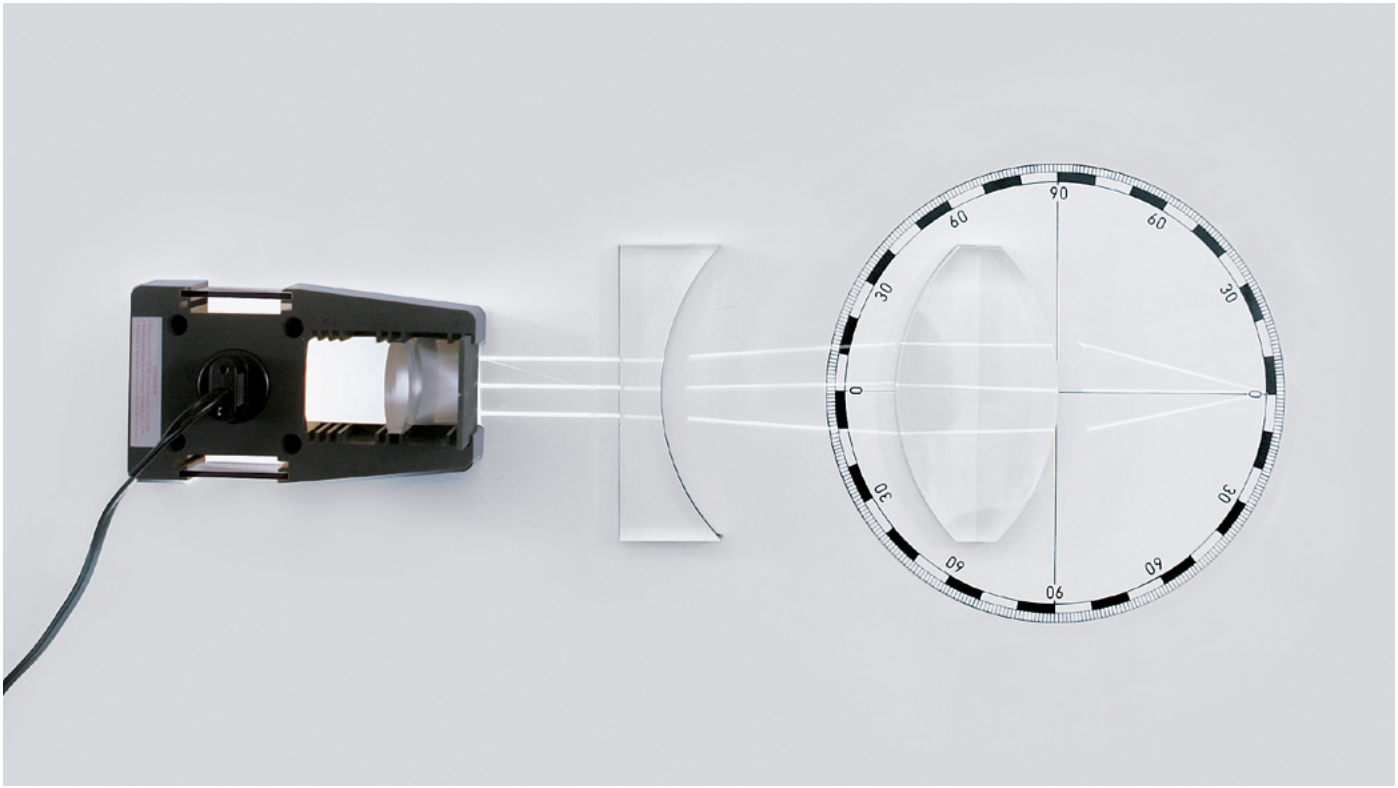




Power supply additionally required, e.g.:

55217 Power supply unit 12 V (see page 79)

47095 Materials for demonstration



Detailed instructions for 22 experiments:

- Linear propagation of light
- Narrow light beams
- Shadows
- Reflection of light
- Law of reflection
- Double mirror
- Reflection at concave and at convex mirrors
- Refraction of light (3 experiments)
- Refraction of light in water
- Refraction of light
  – at a prism
  – at a converging lens
  – at a diverging lens
- Parallel light rays
- Lens combinations
- Human eye model/correction of short-sightedness
- Dispersion of light
- Additive colour mixture
- Subtractive colour mixture

Also recommended:

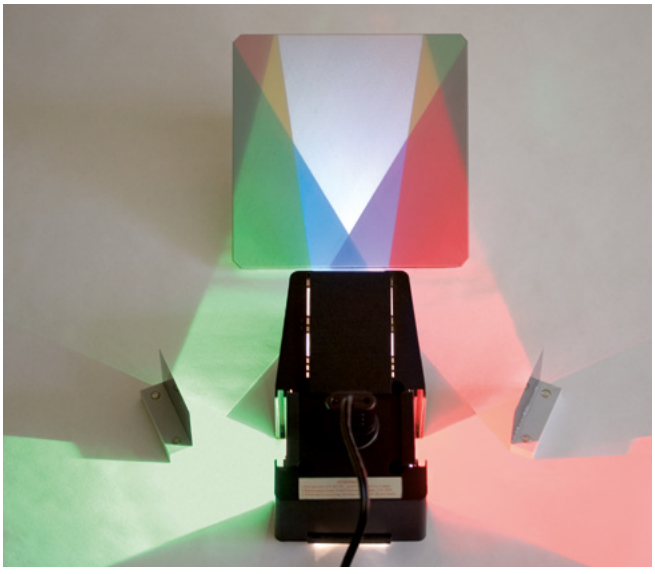
Coloured mixture accessories for *Optics for the steel board* (*47095*)

Consting of two plane metal mirrors on magnetic stand bases, one each foil filter red, blue and green in frame and a 30° inclined screen of white plastic on magnetic base.

Mirrors and filter: 50 x 50 mm
Screen: 150 x 150 mm

Additionally required:
47095 Optics for the steel board

47487



Demo

Demonstration kit **Geometric optics** *for the steel board*

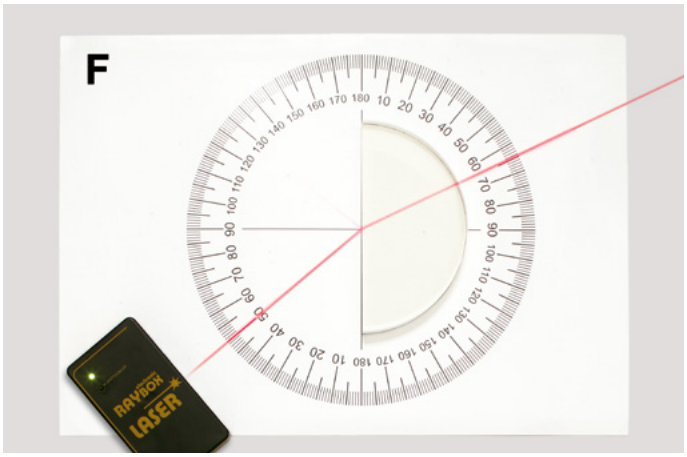
These model bodies can be used on a steel board in conjunction with *Laser Ray Box 47128* to demonstrate the following laws of ray optics:

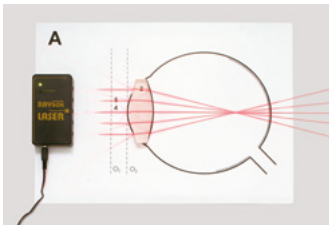
- Path of rays through convex or concave lenses
- Path of rays through a prism
- Reflection from plane and curved mirrors
- Refraction of light
- Refractive index

In addition, it is possible to demonstrate the path of rays in normally sighted, short sighted and long sighted eyes, as well as how sight defects can be corrected using lenses.

The outlines of the eye are depicted on a pre-prepared adhesive foil sheet. The functioning of optical instruments such as cameras or telescopes can also be shown using adhesive sheets and the model bodies. Total internal reflection inside a glass fibre cable can also be demonstrated.

The bottoms of the model bodies and adhesive sheets are coated with magnetic foil so that they can stick to any steel board.

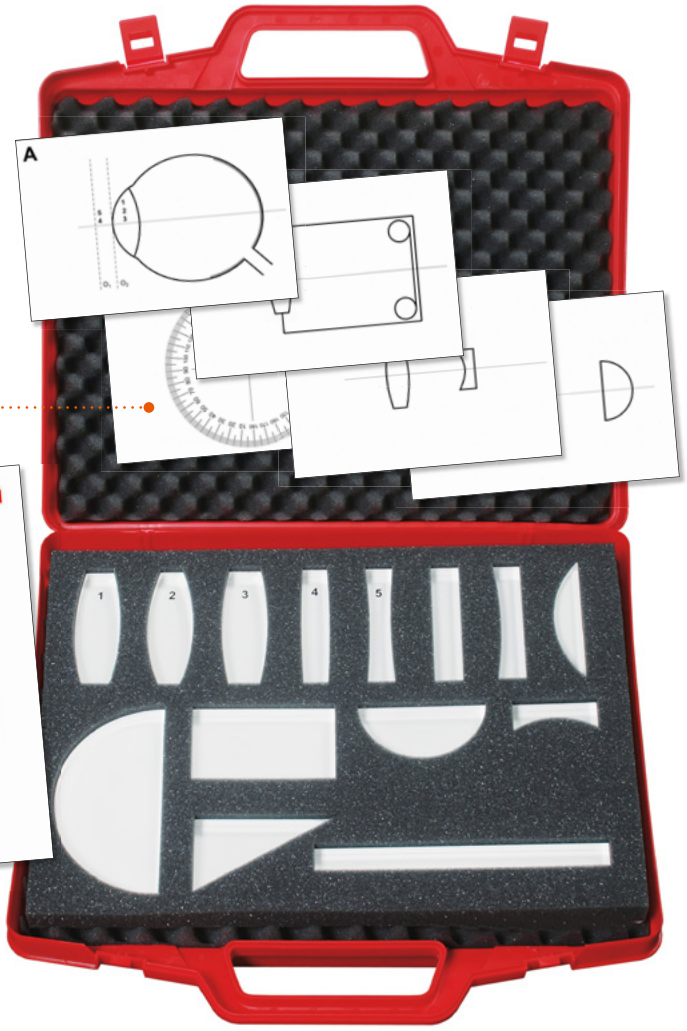




Adhesive sheets

Experiment description

Included in delivery:



Laser additionally required, e.g.:

47128 Laser Ray Box, magnetic adhering

The Laser Ray Box can be stored in the case of the kit

47080 Materials for demonstration

Demonstration kit Functional human eye model

To demonstrate the optical functions of the eye such as creation of the image of an object on the retina, accommodation (change in curvature of the lens), short- and long-sightedness.

Detailed instructions for 8 experiments:

- Projection of an image on the retina
- Function of the iris diaphragm
- Accommodation of the eye
- The normal sighted eye
- Short-sightedness
- Long-sightedness
- Demonstration of presbyopia (age-related long-sightedness)
- The yellow spot and the blind spot of the eye

Included in delivery:

Experiment description

47030	Materials for demonstration

Demo

Demonstration kit **Optical bench** – *Basic collection*

For demonstrating fundamental laws of light. The kit contains all the individual components and equipment needed for investigating the propagation of light, reflection of light, refraction of light and dispersion of white light into its component colours.

The design and function of the human eye along with the most commonly used optical instruments are also illustrated and investigated in experiments.

Optical light using halogen lamp, 12 V/50 W

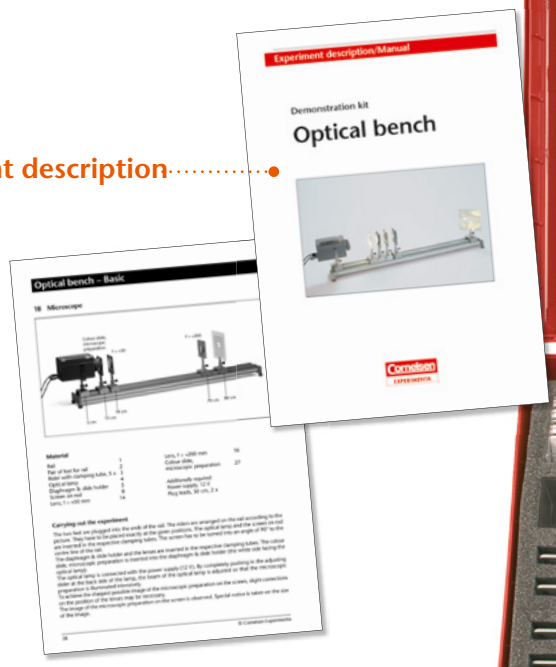
- Particularly bright light source for universal use in experiments on an optical bench and for projection purposes.
- Built-in reflective mirror, aspherical condenser,
- Movable and rotatable for aligning the light in lateral and axial planes
- 4-mm sockets plus fork-type mounting on rod for setting it up at an angle.

- Illumination span for halogen lamp: approx. 2000 hours

Power: 50 W
Focal length of condenser: +38.5 mm
Dia. of condenser: 50 mm
Lamp socket: GY 6.35
Casing: 240 x 110 x 100 mm
Rod: 10 mm dia.

Included in delivery:

Experiment description



Power supply additionally required, e.g.:

55224 Power supply unit, 6 and 12 V/5 A AC (see page 79)

47600 Materials for demonstration

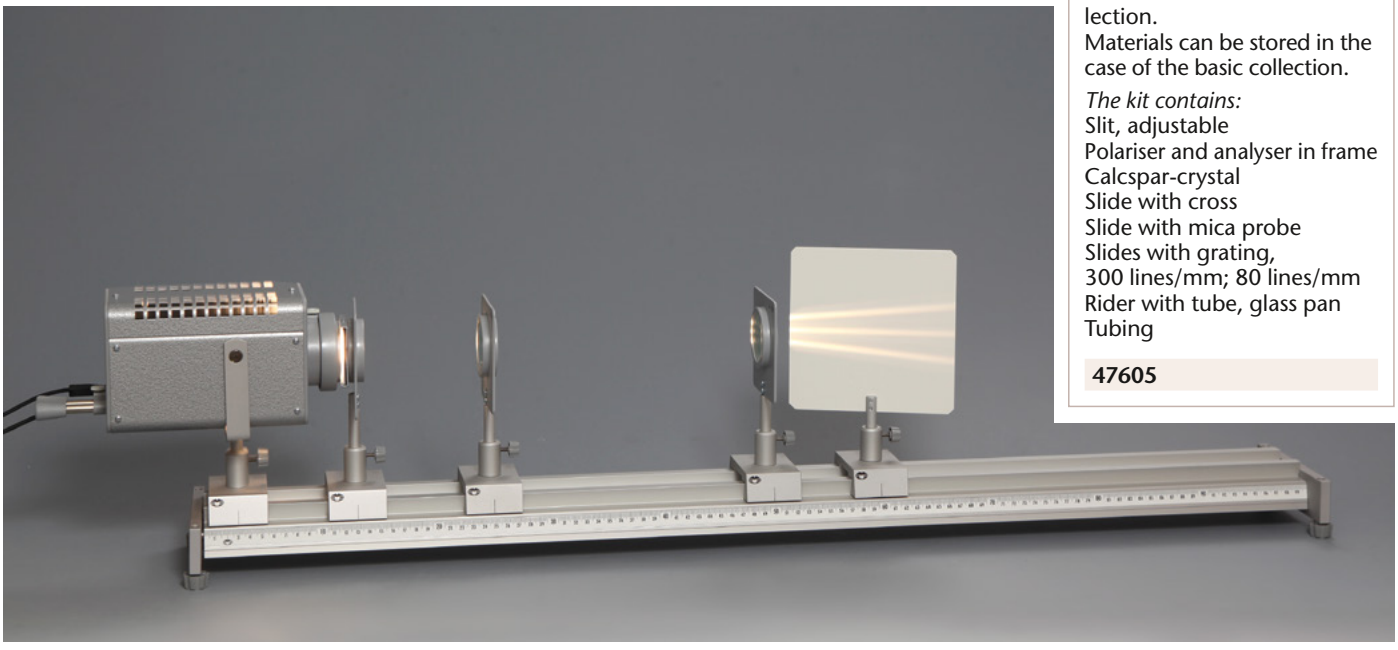
Detailed instructions for 27 experiments:

Survey of experiments for the Basic collection

- Propagation of light
- Formation of shadow
- Pin hole camera
- Reflection at a plane mirror
- Reflection at a curved mirror
- Refraction of light
- Refraction of light in water
- Converging lens
- Diverging lens
- Focal length of converging lenses
- Human eye model
- Human eye
  – short-sightedness
  – long-sightedness
- Magnifying glass
- Astronomical telescope
- Terrestrial telescope
- Slide projector
- Microscope
- Dispersion of light
- Absorption of spectral colours

The manual also describes seven experiments, which can be made with the materials of the Supplementary collection

- Diffraction at a slit – interference
- Diffraction at a grating
- Polarisation
- Polarisation by birefringence
- Stress birefringence
- Chromatic polarisation
- Turning of the polarisation plane



Also recommended:

Demonstration kit 'Optical bench – Supplementary collection'

The kit contains all materials to demonstrate the wave nature of the light. The kit *47605* is required to carry out the experiments, which are described in the manual delivered with the basic collection.
Materials can be stored in the case of the basic collection.

The kit contains:
Slit, adjustable
Polariser and analyser in frame
Calcspar-crystal
Slide with cross
Slide with mica probe
Slides with grating, 300 lines/mm; 80 lines/mm
Rider with tube, glass pan
Tubing

47605

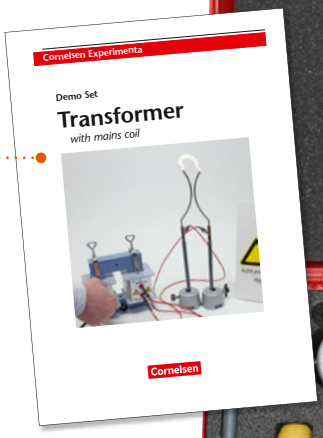
Demo

Demonstration kit **Transformer** *with mains coil*

Transformer operated with a line powered coil for the following demonstration experiments:

- Electric welding (high current)
- The melting channel (high current)
- The ignition plug (high voltage)
- Horn lightnings (high voltage)
- Thompson's levitating ring

Included in delivery:



Experiment description

- for 5 experiments

54000	Materials for demonstration


24000 Wdg.
600 Wdg.
max. 2,5A
3,5Ω

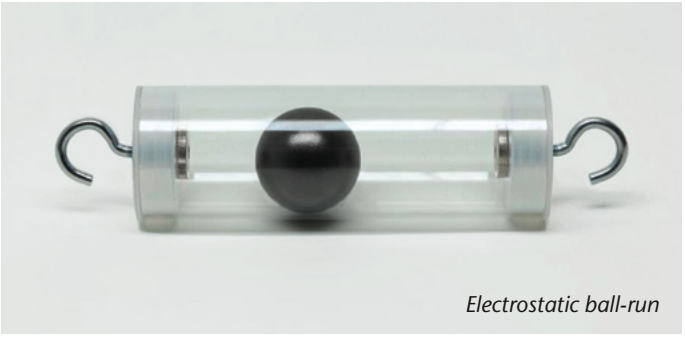
Demo

Demonstration kit **Electrostatics**

The kit allows to carry out a series of interesting, partly historical, experiments on electrostatics.

Most parts are equipped with a 4 mm plug to mount them easily exchangeable on an insulated stand.

For connections to the charge source plug leads or the included metal chains can be used.



Electrostatic ball-run

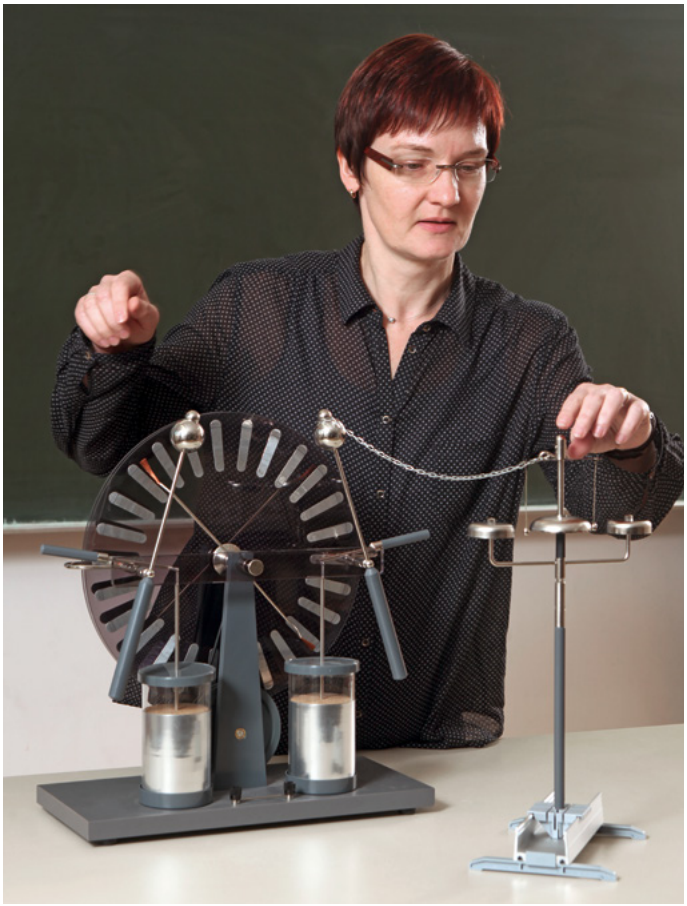
Included in delivery:

Experiment description

Recommended for the production of high electrostatic charge:

50315	High Power Wimshurst Machine (see page 74)
	or
50300	High Power Van de Graaff Generator (see page 75)

50332	Materials for demonstration

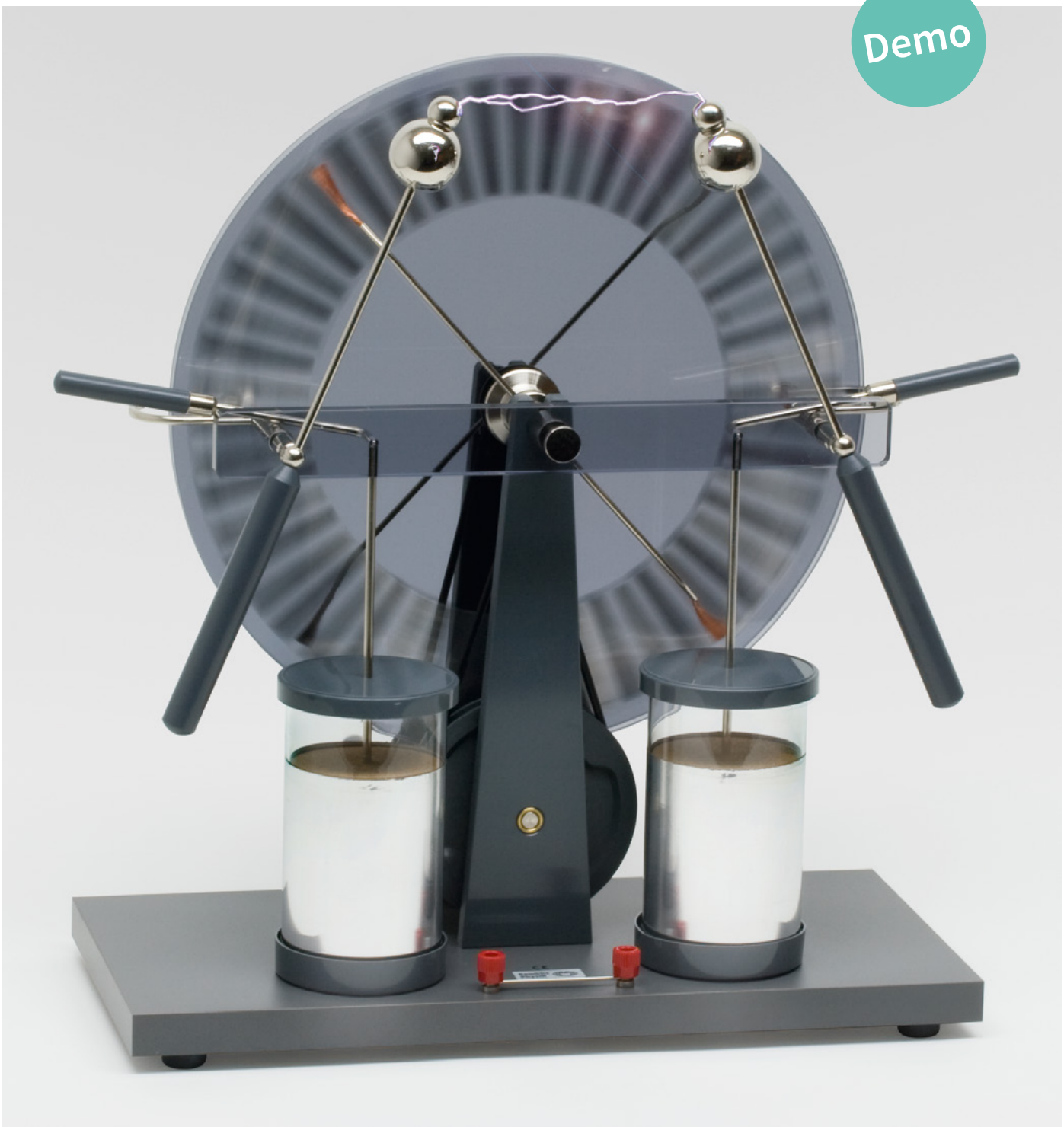


Detailed instructions for 8 experiments:

- Force action between charged bodies
- Brush electroscope
- Electric dance
- Peak discharge
- Electrostatic filter
- Electric chimes
- Electrostatic ball-run connected to
  – an influence machine
  – to a stand mount
- Lightning board

High Power Wimshurst Machine not included in delivery

High Power Wimshurst Machine



For the continuous production of high electrostatic charges.

Mounted on plastic covered wooden base, with crank and belt drive, high insulating perspex discs with metal sectors, two large Leiden jars and spark gap. Including dust protection cover. CE labelled.

Charge: approx. 120 kV
Spark length: approx. 100 mm at low humidity
Disc diameter: 310 mm
Dimensions: 380 x 180 x 430 mm
Mass: 3.4 kg

Also recommended:
50332 Demonstration kit 'Electrostatics'

50315

High Power Van de Graaff Generator

To produce high electric charges for electrostatic experiments.

Large, nickel-coated stainless steel sphere with 4-mm sockets for plugging in equipment, belt guide in transparent plexiglass tube, all set up on a plastic base with an earth socket.

Also features halogen lamp for drying belt, connection box with on-off switches for motor and lamp. Power supplied by a CE certified power supply.

Supplied in ready-built form.

Includes the following accessories:
- Stainless steel sphere, nickel-coated, 100 mm dia.
- Stainless steel sphere, on rod, 300 x 12 mm dia., with earth lead
- Bunch of threads with 4-mm plug pin
- Pointed wheel with needle-point base
- Dust-protection cover
- Power supply with connecting leads

Electric charge: depending on the room humidity 150 to 200 kV
Spark length: max. 12 cm
Short circuit current: approx. 6 µA
Sphere diameter: 270 mm
Operating voltage (mains supply unit): 230 V AC
Dimensions: 720 x 325 x 225 mm
Mass: approx. 4 kg

Replacement belt:
50301 Replacement belt for Van de Graaff Generator *50300*

Also recommended:
50332 Demonstration kit 'Electrostatics'

50300

Demo

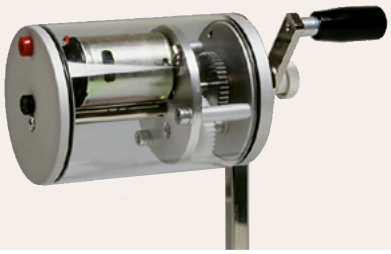
Demonstration kit DynaMot

To carry out teachers' experiments with the hand driven generator DynaMot and the experimental notes by Dr. H. Muckenfuß.

Hand driven generator as power supply and alive teaching support for the formation of concepts in electricity.

DynaMot can be used as a DC-generator as well as a DC-motor and it is able to replace batteries or power supplies in the basic electricity teaching.

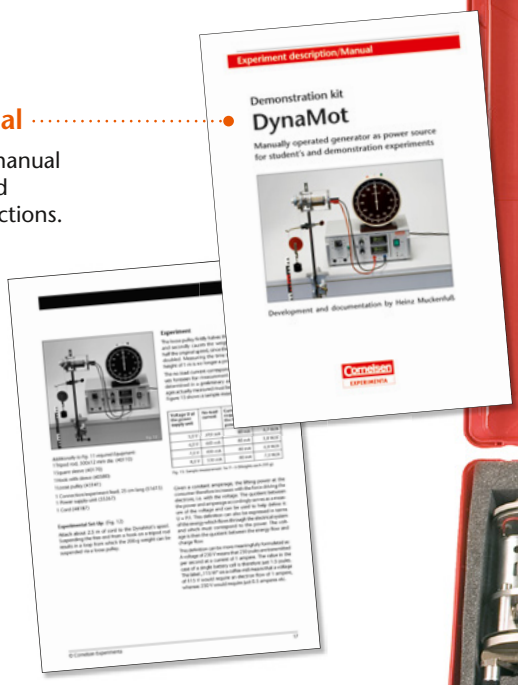
As the students can generate the power for most of the experiments themselves the concepts and theories about the electric circuit are closely connected with personal experiences gathered when generating the electric energy with the generator.



Included in delivery:

Teacher's manual

- With instruction manual for equipment and experiment instructions.



Stopwatch additionally required, e.g.:

41810 Stopwatch for demonstration

Galvanometer additionally required, e.g:

54870 Analogue Multimeter (see page 80)

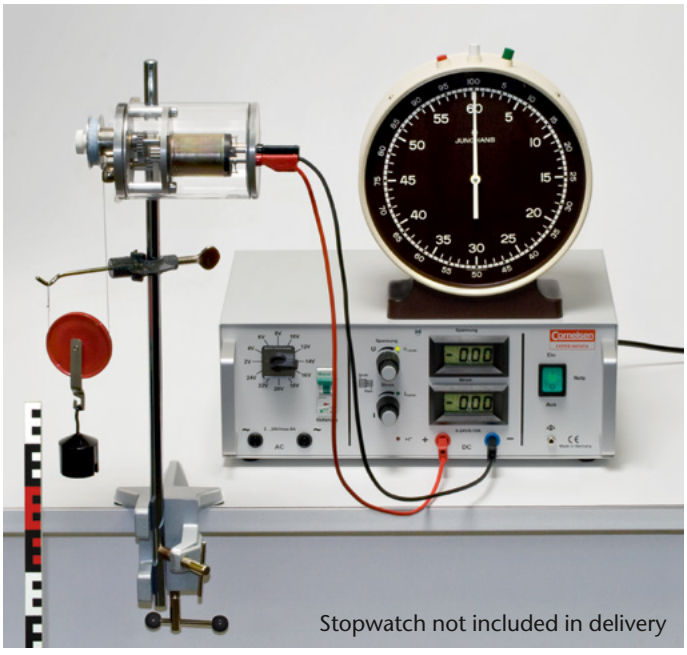
Recommended power supply:

55222 Power supply unit 12 V/3 A (see page 78)

54852 Materials for demonstration

Survey of experiments:

- Energetic basic ideas, energy current, load carrier, current, current concept, current measuring, mechanic parameter for the energy conversion
- Increasing the power of the energy current with the load carrier current (P ~ I), parallel circuit of consumers
- Energy current and electron current at the electric motor
- Ideas for the voltage concept (P ~ U), series circuit
- Experiments to determine the voltage definition



Stopwatch not included in delivery

Additionally required:

Accessory kit *'DynaMot'*

In the manual further experiments are suggested which can be conducted with the components of the accessory kit.

The kit consists of a lamp holder with 3 sockets MES, a lamp holder SES, set of bulbs for DynaMot experiments and two bridge plugs (jumpers) . All parts can be stored in the box of the Demonstration kit 'DynaMot'.

54845

Supporting Equipment

Please pay attention to the indications we make for output, power, operating voltage etc. and make sure, that the equipment is applicable. Other specifications available on request.

Power supply unit 12 V/3 A

In ventilated sheet steel case, on/off-switch with control lamp and mains cable. 4 mm coloured safety output socket terminals for DC and AC, fi xed voltage selectable in six steps, DC output smoothed but not stabilized, with electronic fuse protection against over-heating and short circuit. CE-labelled.

Outputs: 2/4/6/8/10/12 V DC or AC, max. load 3 A
Operating voltage: 230 V/50 Hz AC
Size: 140 x 130 x 210 mm
Mass: 3.5 kg

55222

Power supply unit 12 V/5 A

In ventilated sheet steel case, on/off-switch with control lamp and mains cable. 4 mm coloured safety output socket terminals for DC and AC, fi xed voltage selectable in six steps, DC output smoothed but not stabilized, with electronic fuse protection against over-heating and short circuit. CE-labelled.

Outputs: 2/4/6/8/10/12 V DC or AC, max. load 5 A
Operating voltage: 230 V/50 Hz AC
Size: 140 x 130 x 210 mm
Mass: 4.5 kg

55262

Power supply unit 6 and 12 V/5 A AC

In ventilated steel case, on/off-switch with control lamp and mains cable. 4 mm safety output socket terminals for AC, fixed voltage 6 V and 12 V. With mains fuse protection. CE labelled.

Outputs: 6/12 V AC, max. load 5 A
Operating voltage: 230 V/50 Hz AC
Size: 150 x 112 x 85 mm
Mass: 2.6 kg

55224

Power supply unit 3 V

Plastic case, with mains plug and 150 cm bifilar connection cable.

Operating voltage:
100–240 V/50–60 Hz
Output: 3 V/1 A DC
Cable with DC power plug
CE labelled

68534

Power supply units, clocked

Plastic case, with mains plug and 150 cm bifilar connection cable.

Operating voltage: 100–240 V/50–60 Hz

	Output voltage	*Output voltage, clocked*
68533	6 V	1 A DC
55217	12 V	2 A DC

Power supply unit, 1.5 to 15 V/1.5 A DC

In ventilated sheet steel case with rubber feet, mains connecting cable, coloured, insulated 4 mm safety connecting sockets, on-off switch with built-in control lamp, fused with automatic breaker, activated either thermal or electromagnetic, all outputs galvanic cut from mains. With ground terminal. CE-labelled.

Built-in analogue display for DC.

Output: 1.5 to 15 V DC, adjustable
Ripple: 10 mV
Operating voltage: 230 V/50 Hz AC
Size: 110 x 80 x 150 mm
Mass: 2 kg

55223

Power supply unit 1 to 6 V/2.5 A DC

In ventilated steel case, on/off switch with control lamp and mains cable. 4 mm safety output socket terminals for DC. Thermal overload and short circuit protection. CE labelled.

Output: 0/1/2/3/4/5/6 V DC, max. load 2.5 A
Operating voltage: 230 V/50 Hz AC

Size: 110 x 80 x 150 mm
Mass: 1.5 kg

55225

Supporting Equipment

Digital Multimeter with Bargraph and USB

Digital Multimeter with automatic range selection, which is characterized by its ease of use, modern and handy design, the extensive measurement functions and a USB interface for recording measurement data.

Due to the high safety standard of overvoltage category CAT III 1000 V and a large digital display with backlight and 62-segment bargraph, this device is best suitable for the education area.

Size: 95 x 190 x 45 mm
Mass: 400 g

- 22 mm, 3 5/6 digit LCD display (max. 5999) with backlight and 62-segment bargraph
- Automatic and manual range selection
- Temperature measurement using type-K probe
- Continuity test and diode test
- Data hold and Hz/Duty function
- Min/Max value mode
- Relative value function
- Auto power off and low battery indication
- Safety: EN 61010-1, CAT III 1000 V; CE; RoHS
- Accessories: holster, carrying case, test leads, Type K thermocouple, 2 pcs. 1.5 V batteries and manual

Voltage DC: 600 mV/6/60/600/1000 V; 100 µV; ±0.5 % +4 dgt.
Voltage AC: 6/60/600/750 V; 1 mV; ±0.8 % +10 dgt.
Frequency-range: 40 to 400 Hz
Current DC:
600/6000 µA/60/600 mA/6/10 A; 0.1 µA; ±1.0 % +10 dgt.
Current AC:
600/6000 µA/60/600 mA/6/10 A; 0.1 µA; ±1.5 % +5 dgt.
Frequency-range: 40 to 100 Hz
Ohm: 600 Ω/6/60/600 kΩ/6/60 MΩ; 0.1 Ω; ±0.8 % +4 dgt.
Capacitance: 40/400 nF/4/40/200 µF; 10 pF; ±3.5 % +8 dgt.
Frequency:
100/1000Hz/10/100kHz/1/20MHz; 10 mHz; ±0.5 % +4 dgt.
Temperature: –20 to +1000 °C; 0.1 °C; ±1.0 % +50 dgt.
Operating Voltage: 2 x 1.5 V AAA (UM-4) batteries

54986

Analogue Multimeter

Analogue Multimeter with mirror scale, point bearing moving-coil-mechanism and central range selector switch for easy operation. Ideal for quick measurements during lessons.

20 ranges; 75 mm mirror scale.

- Sensitivity:
  20 kΩ/V DC – 9 kΩ/V AC
- Continuity test with acoustic buzzer
- Safety: EN-61010-1;
  CAT II 600 V; CE; RoHS
- Accessories: carrying case,
  test leads, batteries and manual

DCV: 3/15/60/150/600 V; ± 3.0 % FS
ACV: 15/60/150/600 V; ± 4.0 % FS
DCA: 100µA/10 mA/500 mA/10 A; ± 3.0 % FS
ACA: 10 mA/500 mA/10 A; ± 4.0 % FS
Ohm: 200 Ω/2/20/200 kΩ/2 MΩ; ± 5.0 % arc
Operating voltage: 3 x 1.5 V AAA (UM-4) batteries
Size: 110 x 175 x 45 mm
Mass: 315 g

54870

Digital Multimeter with Bargraph

Digital Multimeter, characterized by its ease of use, modern and handy design and the extensive measurement functions.

Due to the high safety standard of overvoltage category CAT III 1000 V and a large digital display with backlight this device is very suitable for the education area.

Size: 95 x 190 x 45 mm
Mass: 400 g

- 23 mm, 3 3/4-digit LCD display (max. 3999) with backlight and 41-segment-bargraph
- Auto and manual range selection
- MIN/MAX and Data-Hold
- Hz/Duty function and relative value
- Temperature measurement using type-K probe
- Fast continuity test and diode test
- Auto power off and low battery indication
- Safety: EN 61010-1; CAT III 1000 V ; CE; RoHS
- Accessories: holster, carrying case, test leads, Typ-K-thermocouple, temperature adapter, battery and manual

DCV: 40/400 mV/4/40/400/1000 V; 10µV; ±0.5 % + 4 dgt.
ACV: 40/400 mV/4/40/400/750 V; 10 µV; ±0.8 % + 6
Frequency-range: 40 to 400 Hz
DCA: 400 µA/4/40/400 mA/20 A; 0.1 µA; ±1.0 % + 10 dgt.
ACA: 400 µA/4/40/400 mA/20 A; 1 µA; ±1.5 % + 5 dgt.
Frequency-range: 40 to 200 Hz
Ohm: 400 Ω/4/40/400 kΩ/4/40 MΩ; 0,1 Ω; ±0.8 % + 4 dgt.
Capacitance: 40/400 nF/4/40/400 µF; 10 pF; ±2.5 % + 8 dgt.
Frequency:
100/1000 Hz/1/10/100 kHz/1/10 MHz; 0.1 Hz; ±0.5 % + 4 dgt.
Temperature: –20 to +1000 °C; 1°C; ±1.0 % + 4 dgt.
Operating voltage: 9 V-Battery

54985

Mini Digital Multimeter

Portable instrument with rotary switch for the range selection of voltage, current and resistance. All ranges overload protected. With diode- and transistor tester.

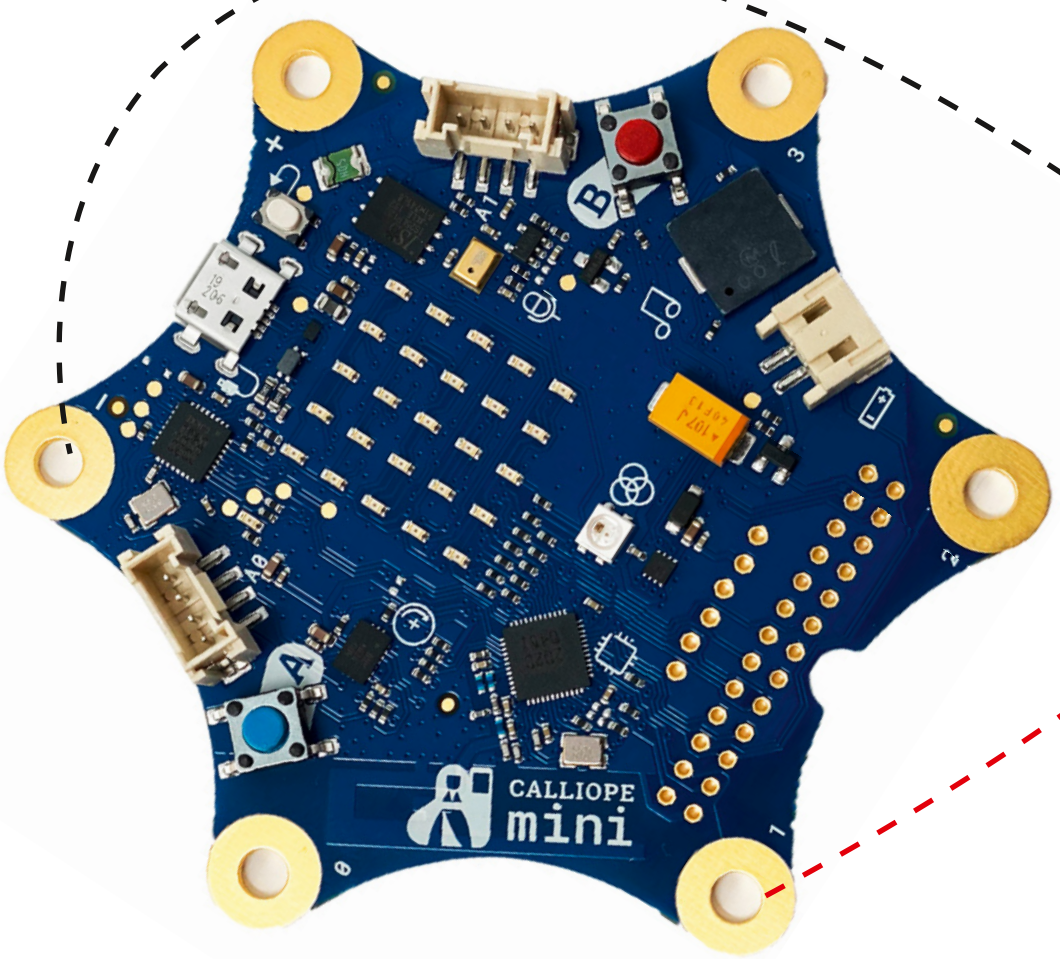
Solid plastic housing with hinged stand, 4 mm safety sockets, a pair of measuring cable with test prod, fine-wire fuse, K-type temperature sensor and 9 V battery.

Size: 70 x 128 x 28 mm
Mass: 140 g

Voltage DC: 200 mV, 2/20/200/600 V; ±0.5 %
Voltage AC: 200/600 V; ±1.2 %
Current DC: 2/20/200 mA, 10 A; ±1.2 %
Resistance: 200/2000 Ω, 20/200/2000 kΩ; ±1.0 %
Temperature: 0 to 1000 °C; ±2.5 %
Safety: IEC-1010-1; CAT II 600 V
Battery: 9 V 6F22

54892

Calliope mini – Coding for everyone



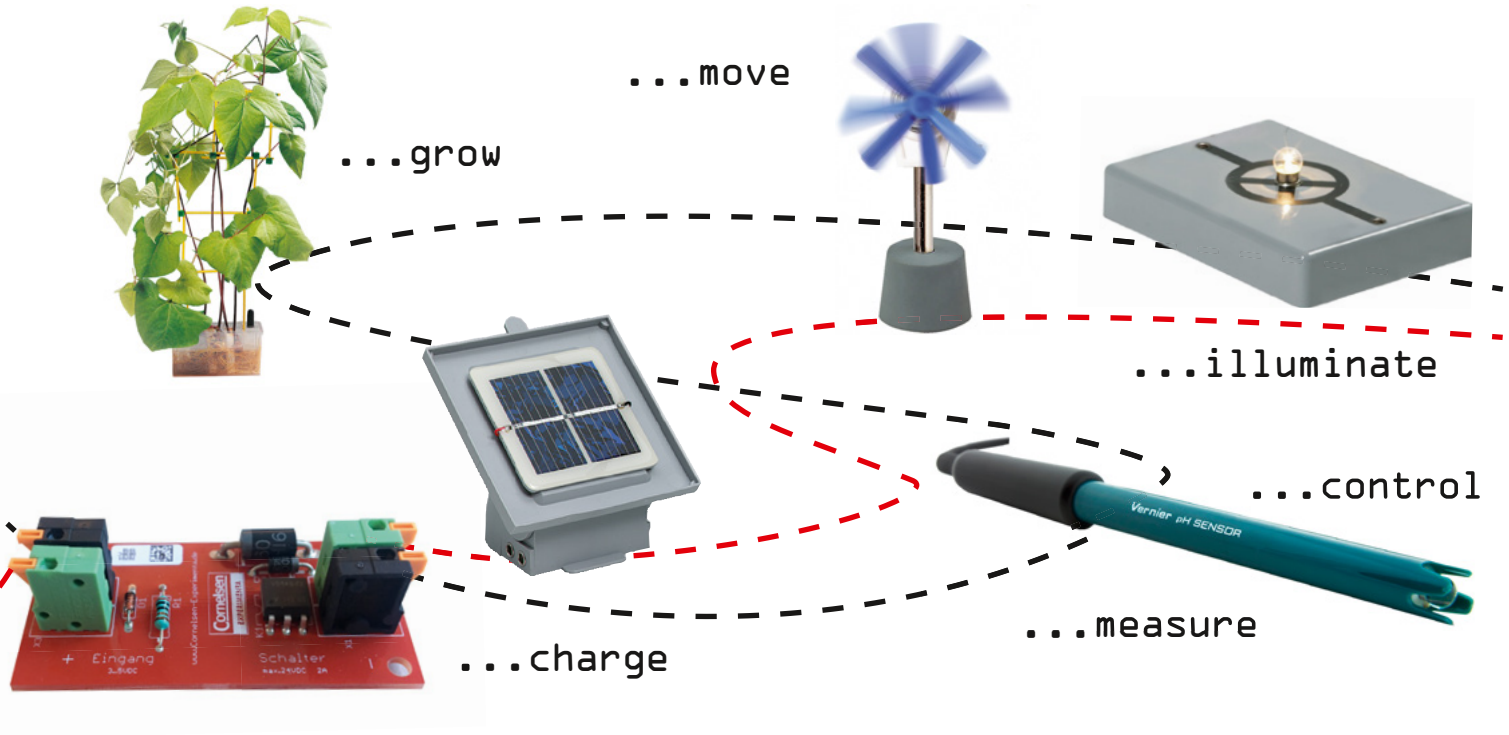
Calliope mini is a tiny controller designed to show you the fun in programming.
Get creative and start coding!

It was developed by an interdisciplinary team with specialists IT and education sectors. As a didactic cooperation partner, the Cornelsen Verlag created student and teacher material with a free OER-License for using the Calliope mini in class. By using these materials a coding competence is being developed starting in 3rd class whilst working on school content.

How does it work?

Calliope mini starts automatically as soon as it is connected to the power supply. A demo sequence welcomes the user to get to know the different input options. From there on accompanying booklets help students to work on different tasks about coding.

Calliope enables you to…



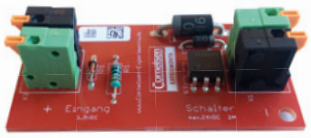
Boson kit

A practical set with modular, electronic components to be easily connected to Calliope mini. It contains eight selected modules, which cover the most common digital and analog sensors and components.

21650

Electronic switch

The interfaces of Calliope has low electrical output.
The switch enables lamps, pumps or electromagnets to operate directly and to visualize effects.



21600

Calliope mini – Starterbox

- Calliope mini
- battery holder with batteries
- USB cable
- Rubber band
- Stickers
- Booklet

21800

Calliope mini – Class set for secondary schools

The class set for Secondary schools includes 20 Calliope mini Starter Kits as well as additional accessories such as 10 Grove moisture sensors and 10 Grove ultrasonic distance sensors.

- 20 Calliope starter boxes
- 10 Grove moisture sensors
- 10 Grove ultrasonic
- distance sensors

21920

eXperiBot
get ready for the future

Students have already heard of self-driving cars, networked data worlds and intelligent machines. However, do they understand what's behind it? If they want to be able to participate in the digital world, children must develop skills understanding programming concepts. This means identifying problems and breaking them down into individual small steps, developing strategies and thinking abstractly and creatively.

You can find extensive information at
cornelsen-experimenta.com/experibot

Arianna, the programmer, encourages students to look over her shoulder when it comes to making the logic of coding understandable to them from the 5th grade onwards.

eXperiBot

Included in delivery:
1 quick guide for teachers
with step-by-step instructions for
- Assembly of eXperiBot
- installation of software
- 3 first projects

Download area at
cornelsen-experimenta.com with
- editable first project worksheets
- additional projects with worksheets
- sample solutions

The Blockly app is available for
- Android 5.0 tablets
- iOS 11.0+ tablets
- Windows 10 and
- MacOS 10.13

Made in Germany

TINKER BOTS

Cornelsen

71601	eXperiBot educational robot set
71602	eXperiBot educational robot set of 2

Educational robot – click, click, ready

The eXperiBot educational robot is ready for programming in only 8 steps.

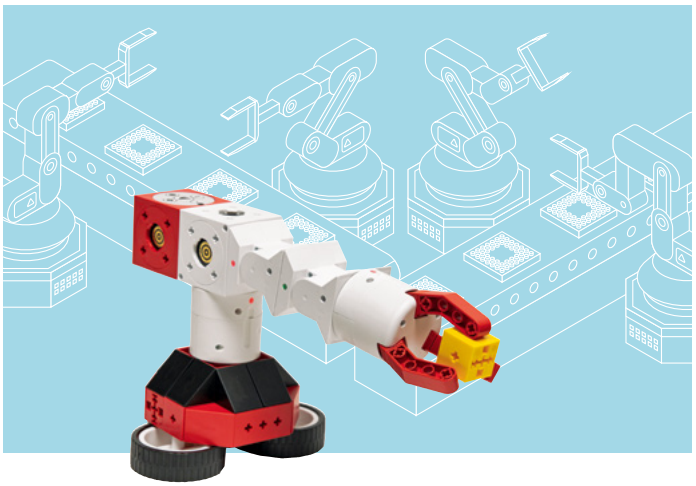
eXperiBot is directed by colours, lines and gestures by a **multi sensor**.

A **double engine** enables eXperiBot to turn, rotate and drive curves.

The **Powerbrain** is the heart of eXperiBot. It contains a computer, a powerful Li-ion battery and a Bluetooth interface.

Anything is possible

eXperiBot is reduced to the essentials. In addition, the eXperiBot can be equipped with wheels, further cubes, grabbers, rotating elements (twisters), joints (pivot), a single motor and various small parts can be easily combined. Even LEGO® bricks can be added using the adapter plate supplied.



Thanks to Arianna, students and teachers find their way into the world of coding and robotics super easy. Teachers get optimal support for confident teaching, too.

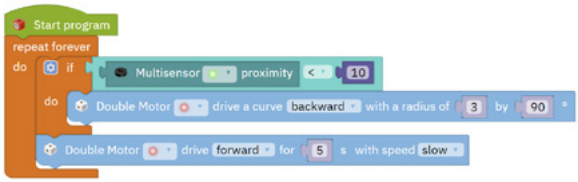
Programming – made simple with graphics

Blockly enables students to program intuitively.

By using drag & drop children from the 5th grade can learn basic programming concepts.

The selection of different learning levels within Blockly is a big advantage itself.

Individual and flexible selection options for the graphic elements are adapted to the respective level of knowledge of students.



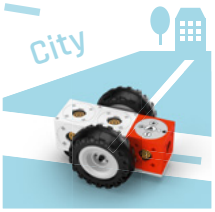
In preparation:

Contextual teaching materials with additional components and worksheets

71630 Smart factory
Additional parts, teachers' handout and worksheets online

71640 City of the future
Additional parts, teachers' handout and worksheets online

71650 Maze of opportunities
Additional parts, teachers' handout and worksheets online



Concentrate completely on the experiment with eXperilyser®

The all-round app

eXperilyser® doesn't replace any experiments, but supports them using digital technology. Seven amazing modules in a single app cover experiments in all STEM subjects. eXperilyser® allows pupils to devote their attention to the experiment without neglecting the measurements and analysis.

A digital camera, such as one built into a tablet or smartphone, is used as a measuring instrument in all seven modules.

The camera is used to read measurement data, e. g. from digital displays (scales, multimeters), liquid columns (burettes) or needle deflections on dials (hygrometers, ammeters, blood pressure monitors). This data is then available in digital form for further analysis.

DATA LOGGING

Utilising analogue measuring instruments digitally

eXperilyser

Digitise and physically analyse motion in realtime
e. g. an oscillating motion (including coupled pendulums) is displayed as an s-t graph in real time.
The motion can be recorded and the individual data points stored for further analysis

KINEMATICS
track, graph and measure movements live

Make invisible paths visible
Observe with your pupils such things as where the ant trail really goes or which route most cars drive and when.

PATHFINDER
reveal the unseen path

Reliably capture unique instants
Reveal such things as which animal is taking the food or the moment the last drop of water causes the barrel to overflow.

MOTION CAM
catch unique moments

Experience s-t graphs yourself
e. g. pupils can translate the trace of a given s-t graph into their own motion.

GRAPH CHALLENGE
understand graphs the fun way

Speed up slow processes
Reveal such things as the motion of the stars across the night sky or how snails reproduce.

TIMELAPSE
nothing is too slow anymore

Easily measure extreme distances
e. g. measure the diameter of moon craters or the size of intercellular spaces.

MICROSCOPE
measure extreme sizes easily

One license for all seven modules:
Video analysis, tracking, graph challenge, distance measurement, time lapse, camera trap and data logging

eXperilyser®
Licence 71524

Classroom Kit
Video analysis 71500

Contains several pieces of apparatus for six groups of pupils: Materials for building pendulums; adhesive labels (incl. with scale); magnetic buttons in three colours; smartphone holder.

Age 13 – 18

Students kit **Chemistry I** *Substances / mixtures / water*

The kit is designed for the elementary instruction. It includes equipment and materials that are needed to conduct fundamental investigations of materials.

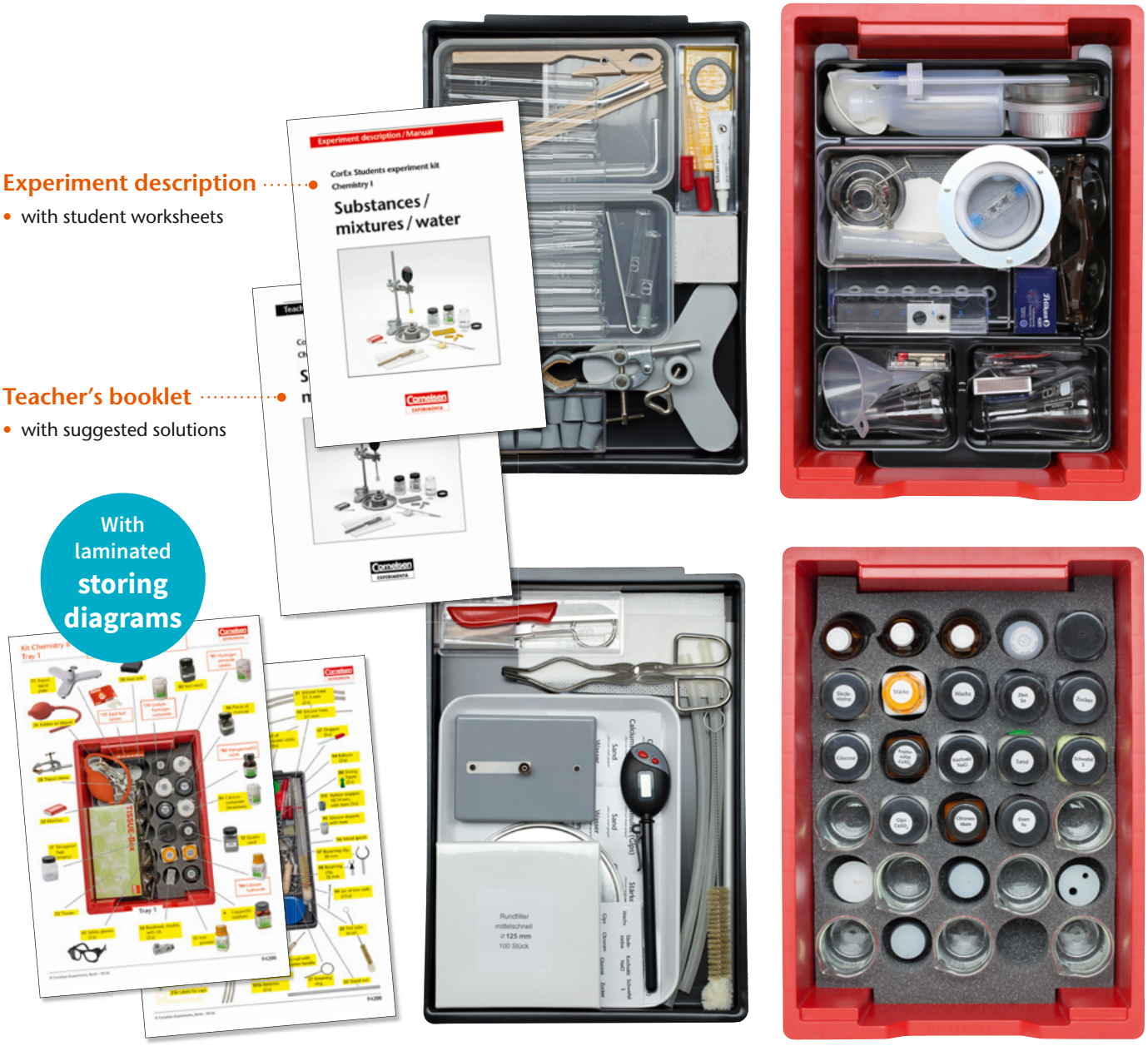
- Substances and their characteristics
- Mixtures and separation of substances
- Composition and characteristics of water

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

With laminated **storing diagrams**



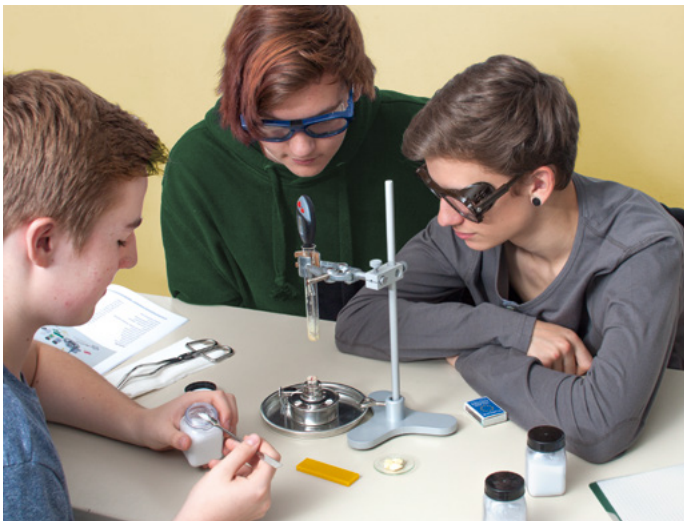
94100	Materials for 1 work group

Detailed manual with 18 experiments:

Substances and their characteristics
- Appearance
- Solubility in water
- Electrical conductivity
- Behaviour when heated
- Solubility of different substances in oil and water
- Melting temperature

Mixture and separation of substances
- Sand/iron powder
- Sand/salt
- Distillation of copper sulphate solution
- Distillation of orange juice
- Distillation of port wine

Composition and characteristics of water
- Aggregate states
- Components of water
- Detection of water
- Electrical conductivity of water
- Processes of solubility of sugar
- Saturated solutions (2 experiments)



Age 13 – 18

Students kit **Chemistry II** *Air / combustion / redox reactions*

The kit allows activity-orientated lessons on the topics *air, combustion* and *redox reactions*.

Additional kit *chemistry II: Air, combustion, redox reactions*

The additional kit contains all equipment and materials from the kit *chemistry II* that are not included in *chemistry I*.
This addition and the materials from the kit *chemistry I* allow it to make all experiments from *chemistry II*. To make the experiments you need the kit *chemistry I*.

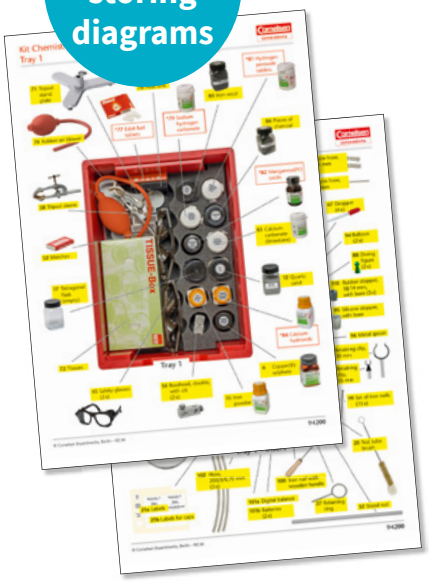
94105

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

With laminated **storing diagrams**



94200 Materials for 1 work group

Detailed manual with 21 experiments:

Air
- Air needs space (2 experiements)
- "Deep sea diver"
- Our breath

Combustion
- Carbon dioxide (2 experiements)
- Oxygen as a prerequisite to combustion
- What gas is formed? (2 experiements)
- Chimney effect
- What gas is left over? (Evidence of nitrogen)
- Combustion products
- Combustion in a closed system
- Iron wool on the balance
- Degree of dispersion and flammability
- Same substance – different ignition temperature
- Extinguishing fire
- Fire extinguisher
- Slow oxidation

Redox reactions
- Reduction of copper(II) oxide
- Refined copper

Age 13 – 18

Students kit Distillation

All usual preparative distillation processes can be conducted safely with this kit. The students can easily recognise the efficiency of water cooling and the possibility to separate fluids because of their different boiling temperatures.

The SVS system is based exclusively on screw connectors consisting of screw cap, silicone gasket and PTFE cuff. This makes the use of the elements of the apparatus much easier for students and it will provide safe and leak proof connections between the components.

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

89756	Materials for 1 work group

Age 13 – 18

Students kit **Extraction**

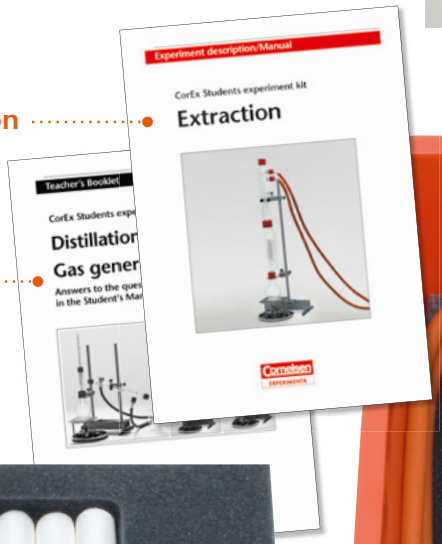
With this kit students can isolate less soluble materials. The special construction of the Soxhlet-extractor ensures that a solvent cycle transports pure solvent to the extraction thimble and thus less soluble compounds are extracted and are enriched in the solution.

The SVS system is based exclusively on screw connectors consisting of screw cap, silicone gasket and PTFE cuff. This makes the use of the elements of the apparatus much easier for students and it will provide safe and leak proof connections between the components.

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



89876	Materials for 1 work group

Age 13 – 18

Students kit Gas generator

With the kit small quantities of most of the standard laboratory gases can be generated.

If the set up is done correctly the gases in the apparatus are only in contact with the materials glass and Teflon (PTFE). The generation of gas can be interrupted easily at any time. In addition a simple apparatus for steam distillation or a simple extraction apparatus can be built from the components contained in the kit.

The SVS system is based exclusively on screw connectors consisting of screw cap, silicone gasket and PTFE cuff. This makes the use of the elements of the apparatus much easier for students and it will provide safe and leak proof connections between the components.

Included in delivery:

Experiment description
- with student worksheets

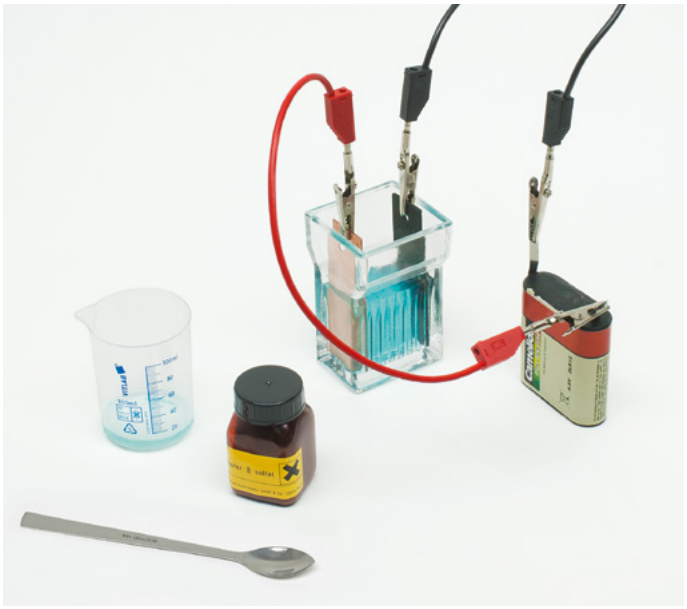
Teacher's booklet
- with suggested solutions

89886	Materials for 1 work group

Age 13 – 18

Students kit Electrochemistry

The kit contains all necessary materials and agents to carry out basic experiments of electrochemistry.



Included in delivery:

Experiment description

Detailed instructions for 5 experiments:

- Conductivity of liquids
- Electrolysis
- Electroplating
- Electrochemical element
- Voltage series

51901	Materials for 1 work group or demonstration

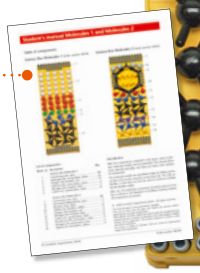
Age 13 – 18

Box *'Molecules 1'*

Box 'Molecules 1' contains atomic models for aliphatic compounds.

Contents:

25 Hydrogen atoms, white, monovalent
5 Chlorine atoms, green, monovalent
15 Oxygen atoms, red, bivalent
5 Nitrogen atoms, blue, trivalent
14 Carbon atoms, black, quadrivalent
60 Flexible connecting pieces, grey



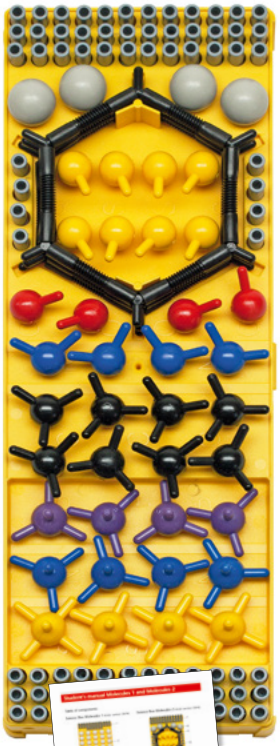
Student's manual

Size of box: 315 x 115 x 53 mm

18474

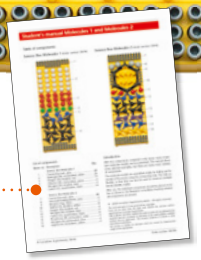
Box *'Molecules 2'*

Box 'Molecules 2' is to be used in conjunction with box 'Molecules 1' only, to build up organic compounds.



Contents:

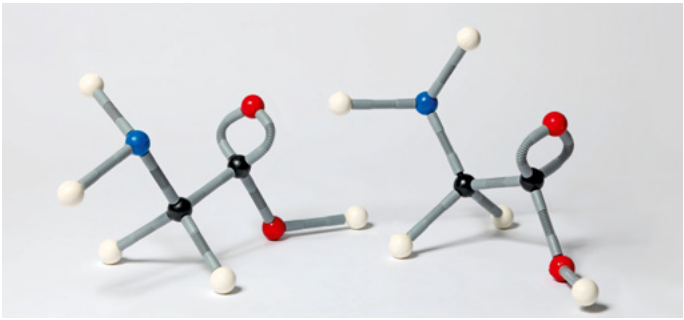
4 Sulphur atoms, yellow, hexavalent
8 Sulphur atoms, yellow, bivalent
4 Phosphor atoms, violet, pentavalent
4 Nitrogen atoms, blue, pentavalent
4 Nitrogen atoms, blue, trivalent
8 Carbon atoms, black, quadrivalent
4 Oxygen atoms, red, bivalent
4 Universal building blocks, grey, monovalent
80 Flexible connecting pieces, grey
3 Models of benzene ring, decomposable, black



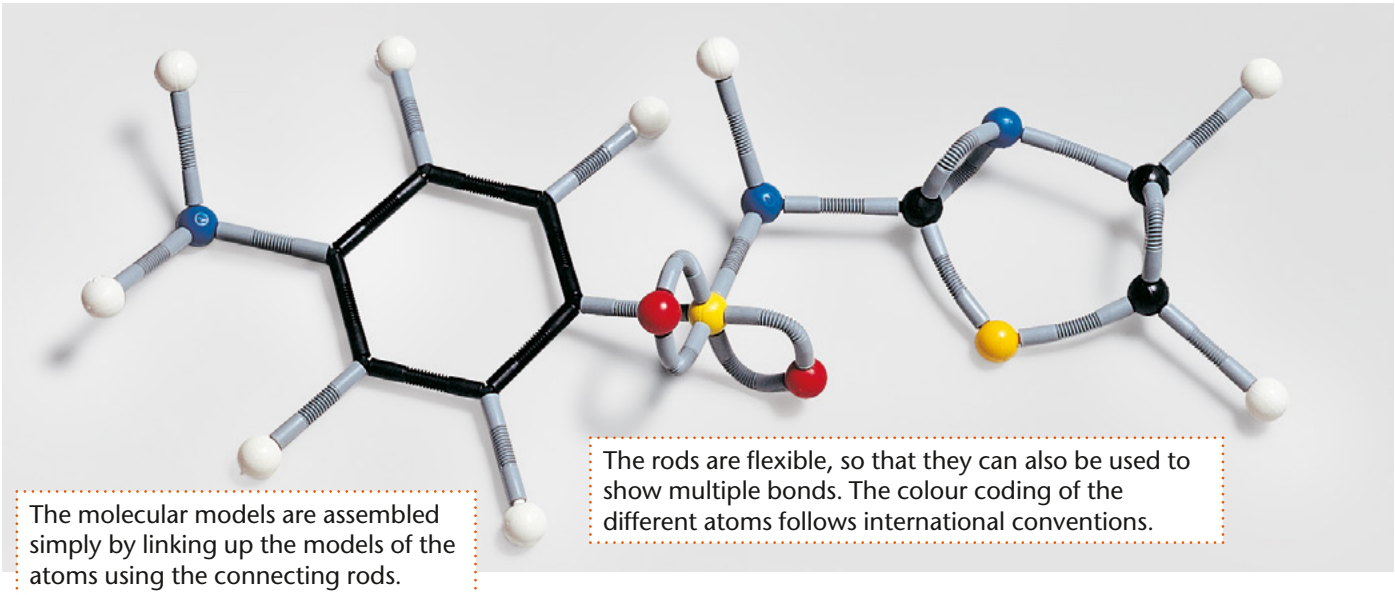
Student's manual

Size of box: 315 x 115 x 53 mm

31810



The positions of the atomic nuclei and the bonds between the atoms are shown particularly clearly by these structural (rod-and sphere) models.



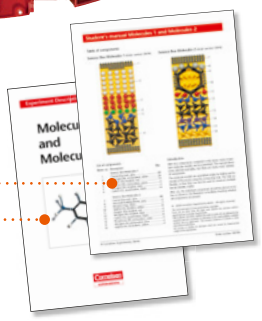
The molecular models are assembled simply by linking up the models of the atoms using the connecting rods.

The rods are flexible, so that they can also be used to show multiple bonds. The colour coding of the different atoms follows international conventions.

Kit *'Molecules 1'*

Contains materials for 10 work groups:

10 x Boxes 'Molecules 1'
10 x Student's manuals
1 x Teacher's manual



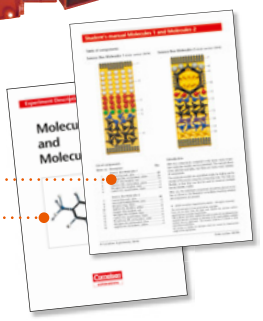
Size of kit: 540 x 450 x 150 mm

31764

Kit *'Molecules 2'*

Contains materials for 10 work groups:

10 x Boxes 'Molecules 2'
10 x Student's manuals
1 x Teacher's manual



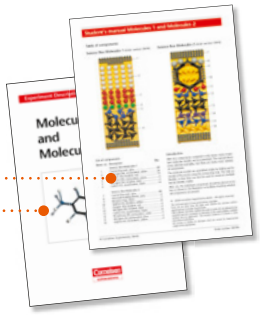
Size of kit: 540 x 450 x 150 mm

42880

Kit *'Molecules 3'*

Contains materials for 5 work groups:

5 x Boxes 'Molecules 1'
5 x 'Molecules 2'
10 x Student's manuals
1 x Teacher's manual



Size of kit: 540 x 450 x 150 mm

36685

Age 8 – 16

Students kit Biology

A very important basis for a profound and successful biological lesson is the carrying out of real experiments with materials specially designed for this purpose.

Important learning aims:

- Observing with a magnifying glass
- Collecting and observing small animals and plants or leaves
- Observing, dissecting and preparing plant parts and animals
- Preparing microscopic slides

The microtome ...

- is a very safe and easy to handle instrument to section biological material.
- cuts thin sections of botanical material or dead animals.
- The section can be taken by the tweezers and be prepared for further investigations.

Included in delivery:

Teacher's manual

18080	Materials for 15 work groups

With the pooter, small insects, spiders and seeds can be collected by carefully sucking them into the it. To take the specimen out of the pooter, the bottom of the flask can be removed easily.

Age 8 – 16

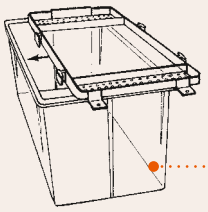
Students kit Germination-Units

Topic **Botany**

- Germination of seeds
- Growth of plant roots stems and leaves.
- Reaction of plants to light and contact stimuli
- Winding and climbing of plants
- Development of plants from the flower to the fruit
- Importance of growth factors for plants such as soil, light, warmth, air, water, water pollution
- Phototropism of leaves and stems
- Geotropism of sprouts and roots
- Swelling force of seeds
- Transpiration of plants
- Assimilation of plants

Topic **Zoology**

With the transparent air permeable lid the multi-purpose container is well suited for use as small aquarium or terrarium for a short term captivity and observation of small animals (small fishes, beetles, worms).



By observing small animals students become acquainted with their habits (movements, breathing, eating and behaviour).

Multi purpose container
150 x 75 x 75 mm

Included in delivery:

Teacher's manual

Multi-purpose container

The multi-purpose container is suitable for making comparisons between germination methods of various plants, for observing the development of plant shoots with roots, stalks, leaves and flowers.
The way the plants twist and coil and seek out light can all be impressively demonstrated as well as the way they react to being touched.
The multi-purpose container is also suitable for keeping small animals and insects inside and observing over long periods when the germination trays are removed.

18085 Materials for 12 work groups

Set Berlese-Apparatus including Stereoscope

The Berlese apparatus (also known as the Berlese-Tullgren funnel) was developed for the biological investigation of soil samples. It is primarily used to sort out microorganisms (microarthropods) from mulch, leaf litter and pine needle litter for experimental purposes.

The Berlese apparatus demo set is intended for both qualitative and quantitative investigation of illustrative soil habitats, and it can be employed in general science lessons as well as for more specialised teaching.

The set 'Berlese-Apparatus' with the stereoscope *89930* enables observing microorganisms.

712009	Set Berlese-Apparatus including Stereoscope *89930*
71200	Berlese-Apparatus

Index

Index

Cornelsen Experimenta GmbH
Holzhauser Straße 76
D-13509 Berlin
Germany

Fon: +49 (0)30 435 902-0
Fax: +49 (0)30 435 902-22

E-Mail:
international@cornelsen-experimenta.com

Cornelsen Experimenta online
cornelsen-experimenta.com

79421 08.20