EduScience UK

PHYSICS AND POWER SUPPLY

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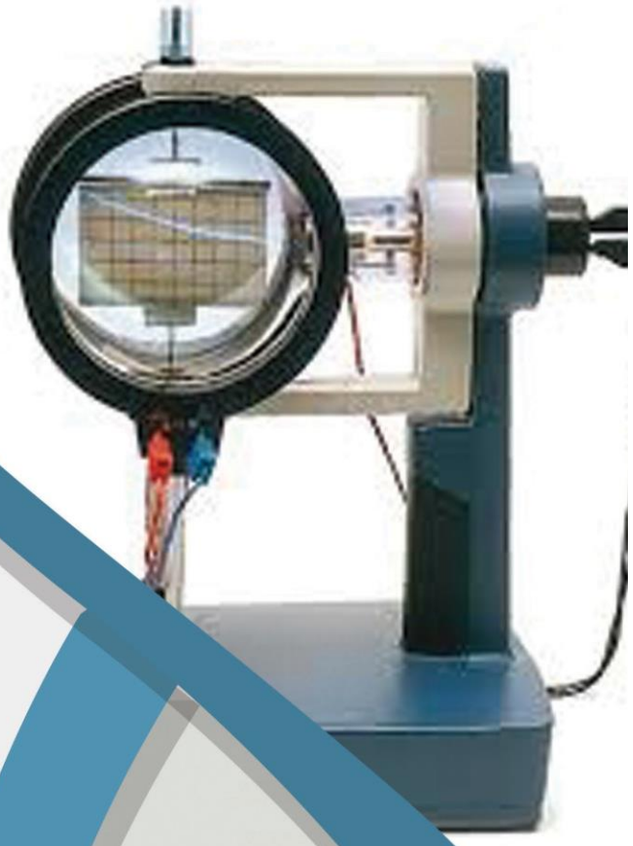
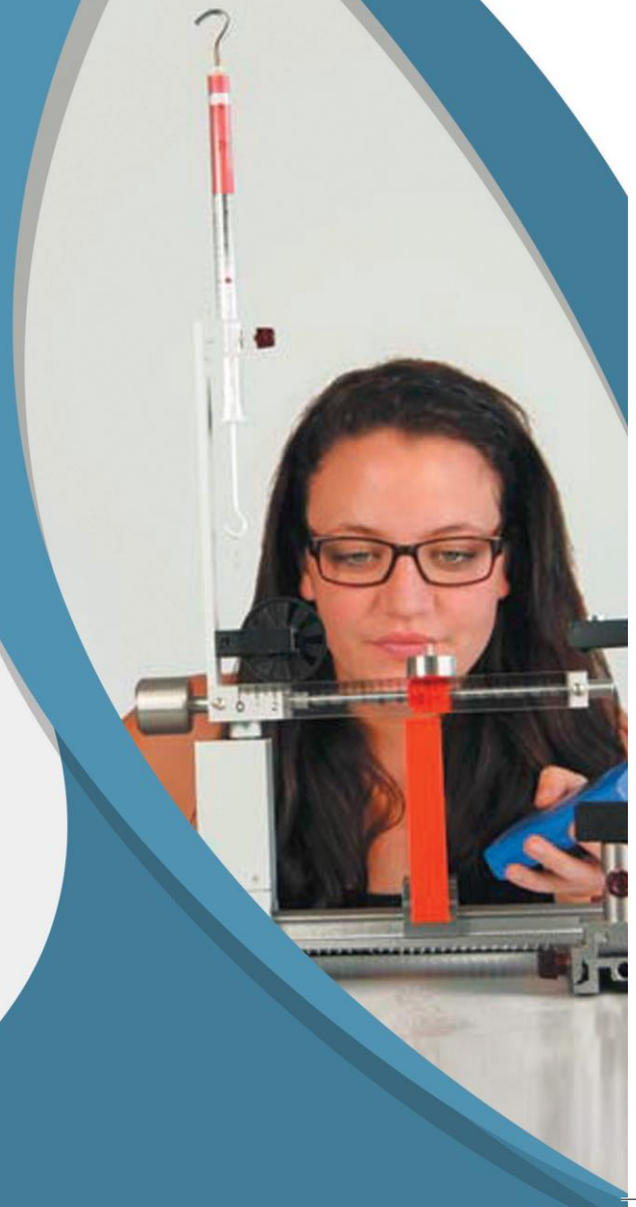


PHYSICS & POWER SUPPLY

- Data Logging & Sensors
- Electricity & Magnetism
- Electronic
- Forces & Energy
- Materials Properties
- Measurements
- Light, Sound & Waves
- Atomic Physics
- Power Supply Units



CMES Data Logger

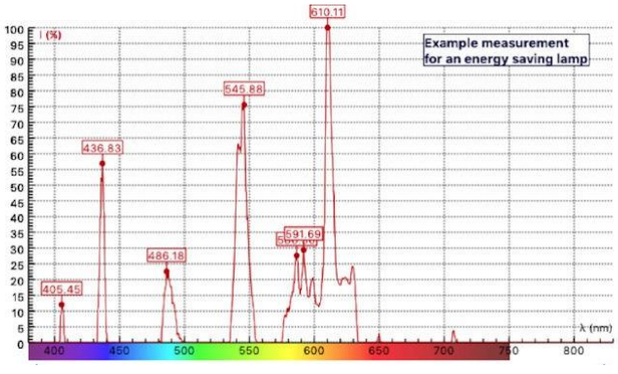
Is a modern advanced graphic data-logger. It is a hand-held Linux device equipped with two processors and 8 GB memory. Works standalone and with Windows and MAC computers.

Display: 5” high-resolution capacitive color touch screen Resolution: 12-bit
Maximum sampling rate: 1 MHz
Sensor inputs: Four analogue BT inputs,two digital BT inputs Built-in: Sound sensor, 3-axis Accelerometer (2g, 4g, 8 g)
Wireless connectivity: Wi-Fi and Blue-tooth® Computer connection: USB mini port
USB port: Full USB for USB peripherals
Power: Rechargeable battery, charging via USB from computer or via power adapter Software on board: Coach Linux
Software on computer: Coach (Windows and MAC)
Includes: Power adapter, USB cable and User’s Guide.

The dedicated desktop applications, installed on CMES , offer tools for collecting data, managing user files, setting up the device and its wireless connection, browsing the web, watching video files, playing audio files, etc. All applications can be easily updated via the CMES Update server available via a Wi-Fi connection.

The powerful Coach Application, installed on CMES , offers live sensor data displays, real-time graphing, tools for data processing and possibilities to create new or open ready-to-go student activities, enriched with texts, images and web-pages. Coach 7 and Coach 7 Lite support measurements with CMES .

During such measurement CMES is connected to the computer via a USB port or communicates via a Wi-Fi connection, and is controlled by Coach running on the computer. The collected data are transferred in real-time to the computer and the measurement can be followed directly on the computer screen. By using wireless connectivity and the VNC protocol the CMES ’s screen can be remotely viewed and controlled from any computer or mobile device connected to the same network.



ESD50000

Data Logger Software , Desktop 5years Single User License

Our Coach software is the most versatile and complete software for STEM Education.

Coach integrates ICT tools, which resemble technologies used by professional scientists and facilitate an inquiry-based approach to education. By collecting high-quality, real-time data, constructing and using models, using simulations and visualizations, comparing results from experiments and models, students can be actively involved in authentic learning activities.

Coach 7 is the successor of Coach 6 and offers new features and enhancements of our unique and powerful environment.

ESD50013

Accelerometer Low-g

The Low-g Accelerometer BT10i can be used to study accelerations in one-dimensional motions. The sensing element of the sensor is located inside the small round box, which can be mounted on a moving object. This is the best choice for most experiments.

Range: -5 g .. 5 g Accuracy: 0.05 g

Can be used to:

- Measure acceleration of a moving car, in elevators, on playground apparatus, during amusement park rides,
- Determine the tilt of an object,
- Investigate accelerations during body movements.

ESD50130

Accelerometer High-g

The High-g Accelerometer BT11i can be used to study larger accelerations in onedimensional motions. The sensing element of the sensor is located inside the small round box, which can be mounted on a moving object. Range: -25 g .. 25 g - Accuracy: 0.2g

Can be used to:

- measure acceleration during collisions,
- investigate larger accelerations.

ESD50131

Angle Sensor *

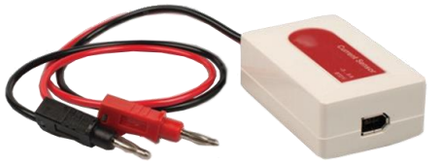
The Angle sensor 013i is a potentiometer, which has a pulley to attach a string to. The sensor is suitable for detecting angle changes and (small) displacements.

Range : 270° (turn), 140 mm (displacement) Resolution

Can be used to:

- Study a pendulum period,
- Measure small displacements,
- Investigate harmonic motion.

ESD50132



Current Sensor High-Range

The Current sensor BT21i is a general-purpose sensor to measure currents in the range between -5 and 5 A. It has two banana (4-mm) plugs for easy connection. The sensing element is a 0.04 Ω resistor connected between the red and black terminals.

Range: -5 .. +5 A

Resolution (12-bit): 3.8

mA **Can be used to:**

- Investigate relationships between voltage and current,
- Verify Ohm's law,
- Measure currents in series and parallel electrical circuits.

ESD50134

Oxygen Gas Sensor *

The Oxygen Gas sensor BT59i measures the gaseous oxygen concentration. The wide measurement range allows it to be used in study of human and cellular respiration.

Range: 0 .. 100 % - Resolution (12-bit): 0.03 % Lifetime: 5 years in open air Can be used to:

- Monitor changes in oxygen concentration during photosynthesis and respiration of plants,
- Monitor respiration of animals, insects, or germinating seeds,
- Measure the oxygen levels during human respiration.

ESD50033

Charge Sensor

The Charge sensor BT19i measures electrostatic charges. It can replace a traditional electroscope by showing not only the polarity of the charge but also performing quantitative measurements. The sensor has three operating ranges, which can be selected using a switch.

Range: -5 .. 5 nC, - 25 .. 25 nC , - 100 .. 100 C - Resolution (12-bits): 0.0025

nC , 0.013 nC, 0.05 nC

Can be used to:

- Measure magnitude and sign of the charge on different objects,
- Investigate electrostatic phenomena,
- Charging by induction, friction and by contact.

ESD50133

Current Sensor Low-Range *

The Current sensor 0222i can be used to measure currents in the range between -500 and 500 A. It has two banana (4-mm) plugs for easy connection. The sensing element is a 0.4 Ω resistor connected between the red and black terminals.

Range: -500 .. +500 mA

Resolution (12-bit): 0.38

mA Can be used to:

- Investigate relationships between voltage and current, verify Ohm's law,
- Measure currents in series and parallel electrical circuits.

ESD50135

Force Sensor

The Force sensor BT42i measures pushing and pulling forces. It uses strain gauge technology. The sensor has two measurement ranges, which can be selected using a switch.

Range: -5 .. 5N, -50 .. 50 N. Resolution (12-bit): 0.003 N, 0.03 N Includes: a thumbscrew, a utility handle, a bumper and a hook.

Can be used to:

- Replace a hand-held spring scale, can be
- Mounted on a ring stand or on a dynamics cart to study collisions.
- Measure of centripetal or frictional forces, study Newton's laws, investigate static and kinetic friction.

ESD50136

NOTE All * Marked sensors need a sensor cable (IEEE1394-BT) ESD50250, which has to be purchased separate.

Relative Humidity Sensor

Relative Humidity Sensor The Relative Humidity sensor BT72i measures relative humidity. The sensor consists of an integrated circuit, which uses a capacitive polymer to sense humidity. The holes in the sensor box provide air circulation.

Range: 0 to 100 %

Resolution (12-bit): 0.04 % RH

Can be used to:

- Study transpiration rates of plants,
- Optimize conditions in a greenhouse or terrarium,
- Determine good days for static electric demonstration.

ESD50034

Thermocouple *

The Thermocouple sensor 0135i measures temperatures in two ranges, which can be selected using the switch. The sensor uses a thermocouple type K, which consists of Chromega and Alomega wires that are welded together to form a measuring junction.

Range: -200.. 1300 °C , -20 .. 110 °C

Resolution (12-bit): 0.39 °C, 0.035 °C

Can be used to:

- Measure the temperature inside a Bunsen burner flame or candles,
- Determine the melting point of copper, bismuth, or other solids,
- Measure temperature in specific heat experiments.

ESD50039

Temperature Sensor *

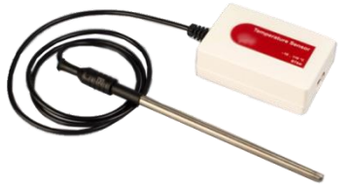
This Temperature sensor BT01 is a low-cost, general-purpose temperature sensor that can be used to measure temperature in the range of -40°C to 140°C, in liquids (water, mild acidic solutions) and air. The sensing element of the sensor is an NTC thermistor, which is positioned in a stainless steel tube. The thermistor is a variable resistor whose resistance decreases non-linearly with increasing temperature.

Range: -20 °C .. 140 °C, Accuracy: 2°C at -40°C, 0.6 at 30°C, 1.8°C at 140°C

Can be used to:

- Monitor indoor and outdoor temperatures.
- Monitorfreezingandboilingwater,
- investigate the temperature during endothermic and exothermic reactions.
- Investigate evaporation

ESD50036



Temperature Sensor

The Temperature sensor BT84i measures temperature and temperature differences in the range between -18 °C to 110 °C. This sensor uses the solid-state temperature transducer, whose output is linearly proportional to the temperature. The transducer is sitioned in the point of a stainless steel tube. In liquids the response of the temperature sensor is quite fast (in between 1.3 and 2.0 s).

Range: -20 °C to 110 °C, Resolution (12-bit): 0.07 °C

Can be used to:

- Monitor indoor and outdoor temperatures.
- Monitor freezing and boiling water,
- Investigate the temperature during endothermic and exothermic reactions.
- Investigate evaporation.

ESD50141

Light Sensor with three ranges

The Light sensor BT50i measures light intensity and has three measurement ranges, which can be selected using a switch. Because of its ranges the sensor is suitable as well for indoor as for outdoor measurements. Full sun illumination is within the range of the sensor. The spectral response of the sensor approximates the response of the human eye.

Ranges: 0 .. 1500 lux, 0 .. 15000 lux, and 0 .. 150000 lux Resolution (12-bit):

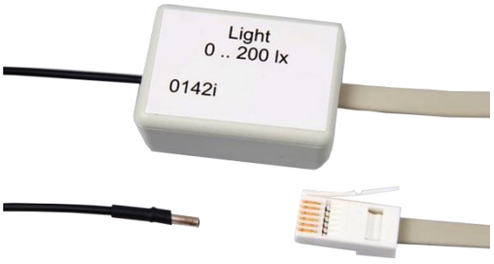
0.37 lx, 3.7 lx, 37 lx

Can be used to:

- Verify inverse square law.
- Investigate light reflection and absorption,
- Study solar energy.
- Monitor monitoring sunrise and sunset times.

ESD50082

NOTE All * Marked sensors need a sensor cable (IEEE1394-BT) ESD50250, which has to be purchased separate.



Light Sensor *

The Light sensor 0142i measures light intensities in the range between 0 and 200 lux. It consists of a photo-transistor, which receives light through a glass fiber. Because of its range the sensor is suitable for measurements in normal indoor situations. The sensor can also be used as a light gate. Range: 0 .. 200 lx - Resolution (12-bit): 0.05 lx

Can be used to:

- Verify inverse square law,
- monitor changes in light caused by a chemical reaction,
- Investigate light reflection and absorption,
- investigate light interference patterns.

ESD50143

Pressure Sensor

The Pressure sensor BT66i is designed to measure absolute gas pressure. The pressure is measured via a pressure valve, which is located on the side of the box. The sensor has two measurement ranges, which can be selected using a switch.

Range: 0 .. 700 kPa, 0 .. 130 kPa

Resolution (12-bit): 0.2 kPa, 0.04 kPa

Includes: a plastic 20-ml syringe with Luer-lock, two plastic tubes (5 cm and 45 cm long), a three-way valve with Luer-lock connectors, two Luer- lock connectors.

Can be used to:

- Measure pressure changes in gas-law experiments, Boyle's and Gay- Lussac's laws,
- Measure vapour pressure of liquids.
- Measure air pressure for weather studies.

ESD50088

Magnetic Field Sensor *

The Magnetic field sensor 024i contains a Hall-element, which is sensitive to a magnetic field. It has two measurement Ranges, which can be selected using a switch. The sensor is suitable for measuring the magnetic field inside coils, or near permanent magnets.

Ranges: -10 .. +50 mT, -100 .. +500 mT - Resolution (12-bit): 0.024 mT, 0.24 mT

Can be used to:

- Measure the magnetic field near a (strong) permanent magnet,
- Investigate the magnetic field near a current-carrying wire,
- Measure the magnetic field near or inside a coil or solenoid.

ESD50146

Light Sensor *

The low-cost Light sensor 0513 measures light intensity and is sensitive to the visible light spectrum and also infrared. Because of its range the sensor is suitable for measurements in normal indoor situations.

Range: 0.1 .. 10 W/m2

Can be used to:

- Verify inverse square law.
- Monitor change in light caused by a chemical reaction,
- Measure the rapid changes of the light intensity.

ESD50144

Motion Detector * (digital BT)

The Motion Detector 0664 uses ultrasound to measure the distance between the sensor and an object. This Motion Detector has a digital BT connector and can be connected to digital inputs of CMES Data logger Range: 0.2 .. 6 to 12 m (depending on an

Object's shape, size and surface) Frequency of ultrasound: 50 kHz - Typical accuracy: ± 1 mm

Includes: a steel rod.

Can be used to:

- Record motions during walking towards and away from the sensor,
- Investigate simple harmonic motion.
- Record motions of objects dropped or tossed upward.

ESD50147

NOTE All * Marked sensors need a sensor cable (IEEE1394-BT) ESD50250, which has to be purchased separate.

Photo-gate with Pulley

The Photo-gate BT63i is a traditional photo-gate, which consists of a light gate allowing detecting objects passing between the photo-gate arms. In this light gate, a narrow infrared beam is directed to a fast infrared detector, which produces very accurate signals for timing. The external (laser) gate mode allows detecting objects passing outside the photo- gate arms.
Includes: a pulley attachment and a steel support rod. The EduScience Drop counter can be attached to the photo-gate for titration experiments (not supplied has to be purchased separately Order Code 0662drop). Up to five photo-gates can be chained in a daisy-chain configuration and connected to a single interface input (IEEE1394 cable not supplied, this cable has to be ordered separately Order Code 07662).

Can be used to:

- Count events,
- Measure the speed of a moving (rolling) object (with the pulley attachment),
- Measure volume in titration experiments (with the drop counter attachment),
- Study pendulum periods,
- Measure the acceleration due to gravity (e.g. by using a picket fence).

ESD50149

Radiation Sensor *

The Radiation sensor BT70i detects alpha, beta and gamma ionizing radiation. The sensor outputs a pulse when decay is detected. Also, a clicking sound is emitted and a LED light flashes. The sensor is suitable to detect low-level radiation, emitted by e.g. potassium fertilizers or gas lantern mantles. Range: 0 .. 1000 cps (counts per second)
Can be used to:

- Monitor background radiation,
- Record radioactive decay and determine half-life,
- Investigate radiation versus shielding.

ESD50150

Motion Detector * (analogue BT)

The Motion Detector BT55i uses ultrasound to measure the distance between the sensor and an object. This Motion Detector has an analogue BT connector and can be connected only to CMES Range: 0.2 .. 6 to 12 m (depending on am object's shape, size and surface) Frequency of ultrasound: 50 kHz Typical accuracy: ± 1 mm Includes: a steel rod.

Can be used to:

- Record motions during walking towards and away from the sensor,
- Investigate simple harmonic motion,
- Record motions of objects dropped or tossed upward

ESD50148

Sound Sensor

The Sound sensor BT80i consists of a microphone followed by an internal amplifier. It measures variations in air pressure caused by sound waves. Because of the high sensitivity, the sensor is very much suited to detect pressure pulses. The dB-calibration in the Coach software allows using this sensor for dB-measurements (up to 124 dB).
Range: -45 .. 45 Pa, Resolution (12-bit):
22 MPa Can be used to:

- Measure sound waveforms and beat patterns,
- Investigate human voice and sounds from various musical instruments,
- Measure the speed of sound through air and other materials

ESD50151

UVB Sensor *

The UVB sensor 0389 measures the intensity of ultraviolet radiation. This sensor consists of a broadband UV sensitive silicon photo-diode and responds primarily to UVB radiation.
Range: 290 to 320 nm Resolution
(12-bit): 0.25 mW/m2 Can be
used to:

- Measure the UVB transmittance of various sunglasses and regular glasses,
- Measure the UVB intensity as a function of time throughout the day,
- Measure the UVB transmittance of fabrics, both wet and dry.

ESD50153

NOTE All * Marked sensors need a sensor cable (IEEE1394-BT) ESD50250, which has to be purchased separate.

UVA Sensor *

The UVA sensor 0388 measures the intensity of ultraviolet radiation. This sensor consists of a broadband UV sensitive silicon photo-diode and responds primarily to UVA radiation. Range: 320 .. 390 nm Resolution (12- bit): 5 mW/m2

Can be used to:

- Measure the UVA transmittance of various sunglasses and regular glasses,
- Measure the UVA intensity as a function of time throughout the day,
- Measure the UVA transmittance of fabrics, both wet and dry

ESD50152

Voltage Sensor (Differential) *

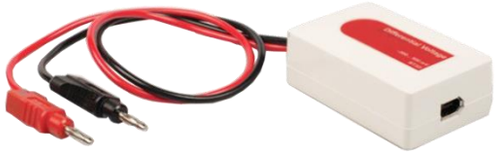
This Voltage sensor 0210i is designed for measuring voltages between 10 .. +10 V. The sensor has differential inputs; measurements can be done directly across circuit elements without the constraints of common grounding. It has two 4-mm plugs for easy connection. Range: -10 ..

+10V Resolution (12-bit): 6.5 mV

Can be used to:

- Measure voltages in AC and DC circuits • record characteristics of a light bulb or a diode,
- Measure voltages in series and parallel electrical circuits.

ESD50154



Voltage Sensor (Differential)

This Voltage sensor BT32i is designed for measuring voltages between

-500 and +500 mV. The sensor has differential inputs; measurements can be done directly across circuit elements without the constraints of common grounding. It has two 4-mm plugs for easy connection.

Range: -500 .. +500 mV - Resolution (12-bit): 338 µV

Can be used to:

- Measure small voltages in AC and DC circuits.
- Record characteristics of a light bulb or a diode
- Measure voltages in series and parallel electrical circuits.

ESD50155

Voltage Sensor *

This Voltage sensor BT02 is a low-cost, generic sensor that measures voltage. This sensor has a direct connection to the inputs of a measurement interface. It has two banana (4-mm) plugs for easy connection.

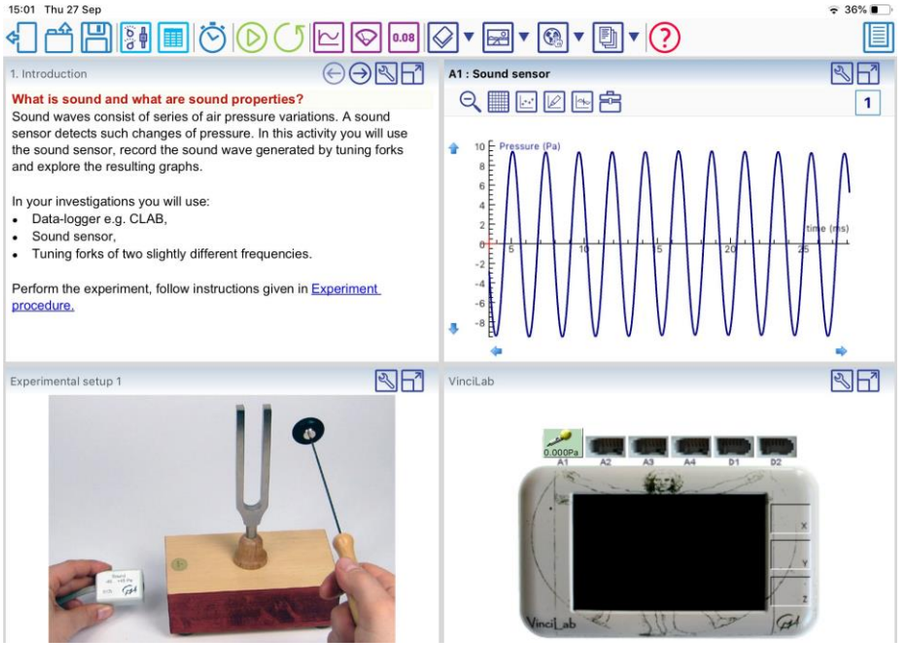
Range: -10 .. +10 V. - Resolution (12-bit):

4.9 mV Can be used to:

- Measure voltage during discharging of a capacitor
- Investigate battery life
- Record electromagnetic induction.

ESD50156

NOTE All * Marked sensors need a sensor cable (IEEE1394-BT) ESD50250, which has to be purchased separate.



Basic Physics Sensors Bundle Kit

• Current Sensor BT21i • Voltage Sensor 0210i • Force Sensor BT42i • Motion Detector 0664 • Light Sensor BT50i • Pressure Sensor BT66i • Sound Sensor BT80i • 2 x Temperature Sensors BT01 • 2 x Photo-gates with Smart Pulley BT63i • 4 Sensor Cables BTsc_4

ESD50157

Physics Sensors Extension Bundle Kit

• Accelerometer BT10i • Charge sensor BT19i • Current sensor 0222i • Voltage Sensor BT32i • Magnetic Field Sensor 024i • Radiation Sensor BT70i

ESD50158

BT-BT Extension cable (analogue)

A 5-m long cable for extending the length of analogue BT sensor cables.

ESD50247

Adapter 4mm – BT

For connecting sensors with 4-mm plugs to interfaces with BT inputs such as CMES Data-logger.

ESD50248

Data-logger stand

Plastic stand for the CMES data-logger.

ESD50249

BT - IEEE1394 cable

The BT – IEEE1394 sensor cable (1.5 m length) is used for BT sensors, which are equipped with the IEEE1394 socket. These sensor cables are sold per piece (BTsc_1) and in packages of four (BTsc_4).

ESD50250

Xllogger system introduction

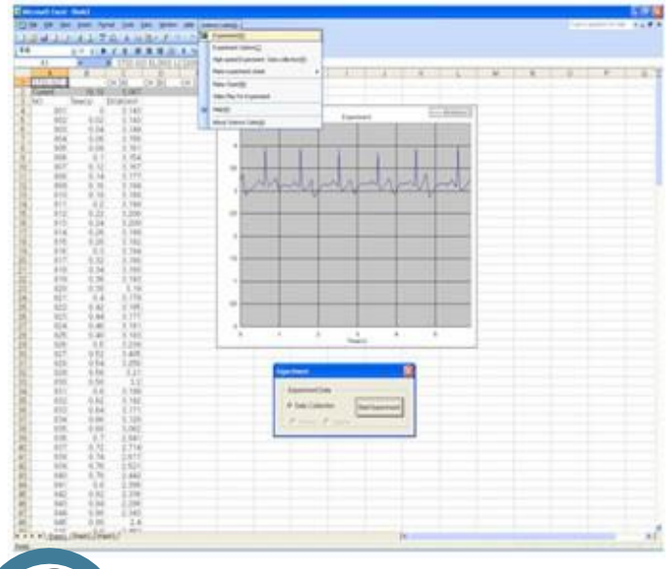
Xllogger is an innovative new data logging system using direct USB sensors & Excel* for data capture and analysis. Our sensors plug straight into USB ports on any Windows computer. No dedicated software program just Microsoft Excel*

Data is logged directly into Excel* and graphed automatically Simple toolbar commands control everything

Completely intuitive - start logging straight away Students work in the familiar Excel* environment

All the power of Excel* for analysing data is immediately available All the standard sensors with new ones being developed

Simply plug them in and start logging (no calibration needed) Robust construction and encapsulated leads



ES Data-logging Software

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ESD50014

USB Accelerometer 5G Sensor
Xllogger Accelerometer 5G.
ESD50199

USB Relative Humidity Sensor
Xllogger Relative Humidity Sensor.
Range: 0 to 100% - Resolution: ±0.4% - Accuracy: ±2% at 25ºC
ESD50187

USB Light Gate Sensor
Xllogger Light Gate Set (pair).
ESD50201

USB Magnetic Field Sensor.
Xllogger Magnetic Field Sensor.
Range: -50 to +50 G Linear Hall Effect Sensor
ESD50200

USB Sound Sensor.
Xllogger Sound Sensor.
ESD50202

USB Voltage Sensor.
Xllogger Voltage Sensor.
Range: ± 12.0 V - Resolution: ± 3.1 mV
ESD50203

USB Current Sensor
Xllogger Current Sensor.
Range: DC ±1.0 A - Resolution: ±6.0 Ma

ESD50204

USB Motion Sensor
Xllogger Distance (Motion) Sensor.
Range: 0.4 - 6.0 m - Resolution: App 1.5 mm - Beam: cone, ~15

ESD50205

USB Barometer Sensor
Xllogger Barometer.
Range: 0 to +2068 hPa (mbar) - Resolution: 0.6 hPa

ESD50188

USB Force Sensor
USB Force Sensor

ESD50206

USB Temperature Sensor
USB Temperature Sensor

ESD50185

USB Light Sensor
USB Light Sensor

ESD50186

Dynamics System
The Dynamics system is designed for use in physics enabling more accurate and precise experiments by minimizing friction. It can be used independently or with EduScience Software and sensors, such as the Light gates, motion sensor, force and accelerometer.
Typical experiments include:
Newtons Law Conservation of Energy Uniform Motion Spring Constant Motion under constant acceleration Inelastic collisions & Elastic collisions

ESD50241

NEW

EduScience Wireless Sensors can be used to measure without an interface. They are simple, user-friendly, and offer more mobility and flexibility. They can be used anywhere without the need for power or wired connections and are suitable for a wide range of student experiments.

Connectivity: The sensors operate wirelessly via Bluetooth or wired via USB and can be used with a variety of

Devices: computers, Chromebooks and mobile devices.

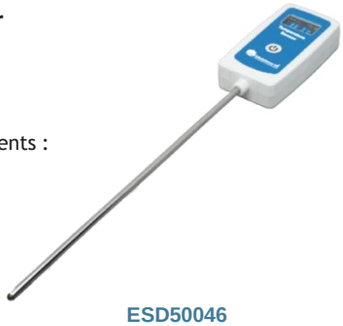
Display: The sensors are equipped with a color OLED screen which displays the battery level and the measured sensor value. This unique feature makes the sensors suitable for use as independent measuring devices.

Battery: The sensors have a large battery capacity and a smart way to save power by automatically turning off when they're not used. They can be used an average of 12 hours without needing to be charged.

work with all platforms on which the ES Data logging Coach software works.

Wireless Temperature Sensor
Range:- 40 to 125 C

Range : -40 to 125 C
Resolution : 0.06 C
can be used for the Following Experiments :
Principle of the mixture.
Cooling.
Thermal equilibrium.
Specific Heat Of Metals.
Radiation equilibrium



ESD50046

Wireless Drop Counter
Measuring Range: 10 drops/sec

Sensing size: 11.5 mm,
sensor diameter: 4 mm, 13 mm
Display: 0.96"
Battery: Li-polymer (700mAh)
Wireless: BLE 4.2
Wired: USB-C
Experiment list : Acid/base titration experiment
Electrical conductivity titration experiment

ESD50106

Wireless Electrostatic Sensor
Range ±0.5 V, ±2 V, ±10 V

Measurement range: ±0.5 V, ±2 V, ±10 V
Display: 0.96"
Battery: Li-polymer (700mAh)
Wireless: BLE 4.2
Wired: USB-C
Experiment list: Charging measurement by induction and frictional contact

ESD50165

Wireless Drop Count

Wireless Voltage Sensor
Range:- 5v to + 15 v

Measuring Range : - 15 v to + 15 v
can be used for the Following Experiments :
Ohm's law (Relationship between voltage and current)
Battery charge And discharge
Series/Parallel connection of resistance
The voltage of a solar cell

ESD50162

Wireless Motion Sensor
Range: 0.15~6.0m

Resolution: 0.001 m. The wireless motion sensor uses ultrasonic waves to measure the distance between objects. Experiment list
Momentum and energy
Free Fall Experiment Constant velocity linear motion Laws of conservation of mechanical energy
Pendulum movement

ESD50171

Wireless Electrode Amplifier Sensor

ESD50166

Wireless Force & Acceleration Sensor Range : -80 to 80 N

can be used for the Following Experiments :
- Hook's Law
- Frictional force
- The synthesis of two forces
- Action and reaction , - The law of Inertia The principle of a lever
Impact and momentum ,
Weight in the water (Buoyant force)

ESD50170

Wireless Magnetic Field Sensor Range : 50~+50 gauss

Range : 50~+50 gauss
Resolution: 0.244 gauss
The wireless magnetic field sensor measures the strength of the magnetic field at the front of the sensor.
The strength of the magnetic field in the solenoid coil, the Helm-Holtz coil, the experiment to prove Fleming's and Lorentz's law, etc., and the X, Y. Z axis measurement range (50G, 2,000G) can be easily changed.
Experiment list
Magnitude of magnetic field according to distance
Find the N and S poles of a magnet
Magnetic field caused by electric current
Magnetic field according to the number of turns of the coil

ESD50167

Wireless Current Sensor Range: - 3.0~+3.0 A

Resolution: 0.5mA The measuring principle of this "Wireless Current Sensor" is that a wire with a unique resistance value is measured using a voltage proportional to the current according to Ohm's last It can be used for Ohm's law experiment with voltage sensor or for magnetic resistance test of electric resistance or current and since it is a wireless sensor, no connecting cable is needed. Experiment list Ohm's law (relationship between voltage and current) Charge and discharge of battery Voltage of solar cell Making a coin battery Resistance depending on the length and cross-sectional area of the sharp core

ESD50163

Wireless Gas Pressure Sensor Range: -1000~+3000hPa

Resoluion:0.244 hPa
Wireless gas pressure sensor" measures relative values to ambient pressure. When measuring pressure, it converts to an intermediate form, such as a displacement, which converts the displacement into an electrical output, such as a voltage or current. This wireless sensor does not require a separate cable so that can be used easily in complex experiment environments. Also, it is possible to connect up to 4 sensors at same time, so you can use it with other kinds of sensors together.
Experiment list ; Boyle's Law ; Cloud creation principle
Reaction rate according to acid concentration
Solubility of Gas with Temperature

ESD50102

Wireless B-Differential Gas Pressure Sensor
Range: -650 ~ 4650 hPa

Resolution: 0.355 hPa
Wireless pressure sensor B has a narrower range than pressure sensor A.
It can measure pressure more accurately, has excellent resolution and is used in chemical experiments where a small amount of gas is generated.
Experiment list
Decomposition of hydrogen peroxide
How clouds are formed
Reaction rate according to surface area
Experiment list
Decomposition of hydrogen peroxide
How clouds ane formed
Reaction rate according to surface are

ESD50103

Wireless Smart Cart
Range: Force: +20N

Range: Force: +20N / Distance: +3,000mm/ Speed: #3 mS
Acceleration: 16g / Gyro: 2,000%
Resolution: Force: 0.01N. 0.1N / Distance: 0.1mm /
Speed: Maximum sampling 200 Hz / Gyro: 0.6%
The wireless cart is a product specialized for dynamics-related experiments and the cart has built in sensors such as distants, speed, acceleration, angular velocity and force, so you can perform various dynamics experiments.
Experiment list
Momentum and energy
Impulse and momentum
The acceleration of the cart due to the fall of the weight.
Law of conservation of mechanical energy
Constant velocity linear motion
Constant acceleration motion

ESD50172

Wireless Light/Color/UV Sensor
Range : -12.5 ~+12.5 mA

Range: - Illuminance: 1 ~199,000
lux Chromaticity: 1 to 65,535 counts
UV: 0~11 UV index
Resolution - Illuminance: 0.1 lux
Chromaticity: 1 count
UV: 0.1 UV index
The wireless Light/Color/UV sensor is a sensor that measures wavelengths from the visible light range to the ultraviolet range so that optics-related experiments can be carried out.
Experiment list
Light intensity according to distance photosynthesis
The brightness of the light bulb depending on the battery light synthesis Principle of sunscreen

ESD50169

Wireless Galvanometer Sensor
Range : -12.5 ~+12.5 mA

Resolution: 0.002 mA
It is a sensor that can measure minute currents and has better resolution than wireless current sensors.
Experiment list
Bio current experiment
Faraday's Law
Electrolyte and non-electrolyte experiments electromagnetic induction

ESD50164

Wireless Thermocouple Sensor

Range: -200 ~ 1200°C

Resolution: 0.6°C
Experiment list
Flash point measurement
Temperature measurement for inner flame, outer flame and flame core

ESD50047

Wireless Sound Sensor

Range: 30 ~ 130 dB A

30 ~ 130dB B
Resolution: 0. 1dB
Experiment list
Decibel measurement
Sound barrier effect measurement
Why are the antennas round?

ESD50168

Wireless Photogate

Experiment list
Measuring the speed and acceleration of an object
Period measurement of simple pendulum motion
Time interval measurement of a moving object
Measurement of gravitational acceleration in free fall motion
Utilization of droplet coefficient in neutralization titration experiment

ESD50173

Wireless Radiation Sensor

Range: 0 ~20 mR/hr

Range: 0 ~20 mR/hr 0 - 20,000 CPM Resolution: 1 CPM
Experiment list Decibel measurement Radioactivity measurement

ESD50104

Electrode Support

1 13 mm (diameter) holder for electrodes
2 temperature holder 4 mm (diameter)

ESD50268

Mechanics experiment device kit Ⅱ

product Include : wireless cart - line - weight set - spring set -
Neodymium magnet(8)
Mechanical experiment equipment accessories
Experiment list
measuring the weight of an object
spring pendulum
conservation of mechanical energy
hooke's law
Newton's second law of motion
constant velocity linear motion
movement on a slope
Momentum and impulse

ESD50267

Resonance kit

The Resonance Kit 060 is a set for measurement and control activities around the concept of Resonance. The kit consists of an adjustable base, a plastic tube, a movable coil, a movable force sensor holder, a spring, a spring holder and a magnet. Instead of a metal rod, a Force sensor (not included in the kit) for measuring spring oscillations can be used. The measurements of induced EMF due to the periodic motion of a magnet can be done. The current carried through the coil can be controlled (turning on and off) through outputs of the interface and the way this influences the magnet, hanging on the spring, can be observed.

ESD50255

Actuator Set

The Actuator Set 062 can be used to introduce the students to the basics of control technology. The set consists of the following elements: 3 red and 3 black 4-mm wires, 12-V switch, lamp holder with 3 coloured 12-V bulbs, 12-V buzzer, 12-V direct current motor, and propeller to connect to motor. All elements make use of the 4-mm buses.

ESD50258

Switch Module

The Switch Module 063 is a solid-state-relay (SSR) that allows you to control 110 – 230 V devices by a voltage of 3 V DC or more up to 25 V). The relay is connected to the mains (110 V up to 230 V) via a Euro-connector at the rear of the module. The relay can supply devices up to 1150 W.

ESD50259

System Board

The System Board 0020 is designed for logic, measurement, control and automation experiments. The sections of the System Board:
The Input block gathers data from the environment and conditions the signal for processing. The signal comes from a sensor in case of a measuring or control system, or a keyboard in case of a computer system. The Processing block processes the signal to achieve a specific system goal. The Output block presents the processed data in a form useful for the user (measurement system) or on the basis of the signal, carries out an action (control system). The Extra components block consists of a 4-bit AD converter and connection to the computer.

ESD50256

Heating Coil

The Heating Coil 018 can be used as an actuator in control systems. The coil has 4 mm plugs for easy connection. The Heating Coil has to be supplied with 24 volt or less.

ESD50260

Mains adapter 9 V for System Board

ESD50257

Dip Needle, 200 mm, Demo

To determine the angle of inclination of the field lines of the earth's magnetic field againt the horizontal; very sensitive, fine-mouned magnetic needle, dark end pointing towards north (the needle is not painted as this would result in an uneven mass distribution and thus an inaccurate result); solid white back plate made of acrylic glass, with semi-circular scale (2 x 0 - 90° in 1° increments); transparent, semi-circular front plate to protect the needle; with direction template and installation base; with handle: L = 30 mm, D = 10 mm; shock-proof packaging using a sturdy cardboard box; Length of magnetic needle: 200 mm Digit height on scale: 12 mm Dimensions (L x W x H) 284 x 21 x 312 mm

ESP59046

NEW

MAGNETIC Needle on Stand

To demonstrate the mutual acting of the magnetic poles & determinate the direction of magnetic field
Length app 100 mm

ESP59045

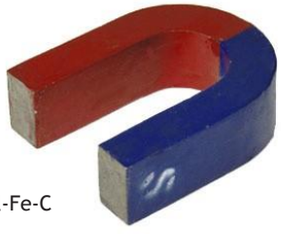
Compass

PLOTTING COMPASS,Diffrent Diameter In aluminium or plastic case, with card dial/ Scale graduated in degree 0-360

ESP59038	DIA. 25MM	In aluminium case with card dial
ESP59039	DIA. 38MM	In aluminium case with card dial
ESP59040	DIA. 42MM	In Plastic Case with point of the compass and needle locking device
ESP59041	DIA. 50MM	In aluminium case with card dial
ESP59042	DIA. 75MM	In aluminium case with card dia
ESP59043	DIA. 100MM	In aluminium case with card dial

Magnet , U Shape Magnet

Used in some physics experiment in the laboratory
Dimensions :
- Overall: Dia 20 x 61 x 80mm
- Sectional **Dimensions :** 10 x 20mm
- Space between poles: 41mm Material: Al-Fe-C Painted Red for North and Blue for South



ESP59049

Magnet , U Shape Magnet, ALNICO

U SHAPE MAGNET, ALNICO, 37 x 6 x 10mm Centre Gap 9mm. With Keepers.

ESP59050

Horseshoe Magnet

chrome steel horseshoe magnets with keepers

ESP59076	**Dimentions :** 75MM
ESP59077	**Dimentions :** 100 MM
ESP59078	**Dimentions :** 125 MM
ESP59079	SET OF 3 DIFFERENT SIZES

U Shape Magnet , Alnico

U SHAPE MAGNET, MADE OF ALNICO , With Keepers.

ESP59051	**Dimentions :** 37 X 6 X 10 Mm Centre Gap 9Mm
ESP59052	**Dimentions :** 50 X 15 X 10Mm Centre Gap 20Mm
ESP59053	**Dimentions :** 75 X 15 X 10Mm Centre Gap 20Mm

Cylindrical Magnet

Cylindrical magnet , Supplied In pair, with keeper.

ESP59054	**Dimentions :** 37 X 10MM (LENGTH X DIA.)	ALNICO
ESP59055	**Dimentions :** 50 X 10MM (LENGTH X DIA.)	ALNICO
ESP59056	**Dimentions :** 75 X 10MM (LENGTH X DIA.)	ALNICO
ESP59057	**Dimentions :** 100 X 10MM (LENGTH X DIA.)	ALNICO
ESP59058	**Dimentions :** 37 X 12MM (LENGTH X DIA.)	Chrome steel
ESP59059	**Dimentions :** 50 X 12MM (LENGTH X DIA.)	Chrome steel
ESP59060	**Dimentions :** 75 X 12MM (LENGTH X DIA.)	Chrome steel
ESP59061	**Dimentions :** 100 X 12MM (LENGTH X DIA.)	Chrome steel

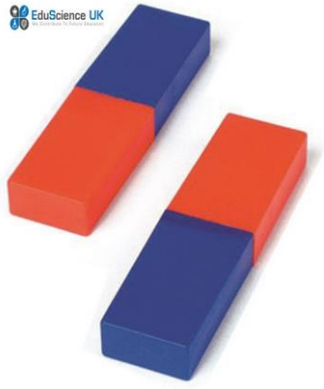
Bar Magnet Rectangular 6 X 19 X 70mm, Red-Blue

Rectangular Bar Magnet 6 x 19 x 70mm, Red-Blue
Dimensions : Overall 6 x 19 x
70mm Material: ALNICO LNG12
Poles of magnet is painted red for North and Blue for South With hole in the centre

ESP59062

rectangular bar magnet made of ALNICO,,Powerful and permanent, in pair, with keepers. Supplied in Cardboard box.

ESP59063	**Dimentions :**	50 X 15 X 10 MM	ALNICO
ESP59064	**Dimentions :**	75 X 15 X 10 MM	ALNICO
ESP59065	**Dimentions :**	100 X 15 X 10 MM	ALNICO
ESP59066	**Dimentions :**	150 X 15 X 10 MM	ALNICO
ESP59067	**Dimentions :**	50 X 15 X 15 MM	ALNICO



Magnet, Bar Magnet, Plastic

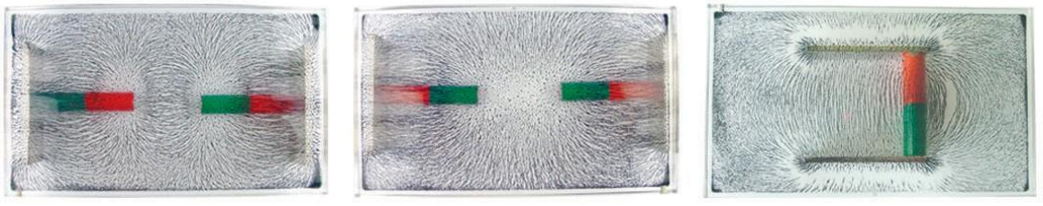
Overall size 80 x 12 x 15mm, per pair with plastic cover.

ESP59068

Magnetic Disc Neodymium

Neodymium magnets have the greatest pulling force of all permanent magnets. We can supply various shapes and sizes of Neodymium magnets. Please contact us for further details.
Dimentions : 10 x 4mm. Pk10.

ESP59070	**Dimentions :** 10 x 4 MM PK 10
ESP59071	**Dimentions :** 15 x 4 MM PK 4
ESP59072	**Dimentions :** 20 x 10 MM PK 4



Magnetic Field Demo Set

Set Including : 1 no Magnetic field plate , 1 no Supporting plate for bar magnets, 2nos Bar Magnet, Alnico, D=10 mm, L=50 mm , 2 nos Pole lamination
, 60 x 25 mm

ESP59083

Magnetic Field Frame ,Field Pattern Window- Transparent

A white frame with transparent window containing magnetic powder in a water based solution for showing magnetic field patterns. When a magnet is present the particles of iron inside become slightly magnetised, so they attract each other and cluster into the lines that show the magnetic field patterns. Includes a pair of small ferrite block magnets and a pair of plastic cased bar magnets and teachers leaflet.
Dimensions : 225 x 130 x 15mm.

ESP59084

Student Magnetism Kit

Kit consisting of:
2x Bar Magnet, 1x Iron filings in box, 1x Pocket compass, 1x Earth-model for magnetic field of earth globe, 1x Magnetic field sensor, 1x Plug pin with needle, 2x Supporting plate for bar magnets, 4x Threaded bolt steel, L=40 mm, 1x Insulating block with socket, 1x Bearing bush for cylindrical magnets, 1x Magnetic field plate, 2x Pole lamination SE, 60 x 25 mm, 1x Paper clip in container, set of 10 ,1x Paper clip with string, 1x Test tube 16x150 mm, plastics, 1x Magnetic field sheet, 1x Magnetic rubber bar, 1x Soft iron ring, 1x Iron nails in box

Storage:
1x Box insert Magnetism, SE
1x Storage box II small, with cover,
Box -insert plan with 2 labels

ESP59080

Magnet Kit

Selection of magnets and materials, assembled in plastic tray with cardboard sleeve. Includes Alnico bars, Alnico button magnets, ferrite blocks & rings, chrome steel horseshoe magnet, Alnico horseshoe magnet, coloured squares of magnetic rubber, plotting compasses 19mm, compasses 14.5mm, chrome rods and Lodestone piece.

ESP59081

Magnet Kit Deluxe

A comprehensive selection of magnets and materials packed in a robust storage case. Includes alnico bars, alnico button magnets, round and square coaxial bars, ferrite blocks and rings, chrome steel horseshoe magnet, alnico horseshoe magnet, iron filings bubble, pair of plastic cased bar magnets, coloured squares of magnetic rubber, chrome steel bars, a metal disc set and plotting compasses.

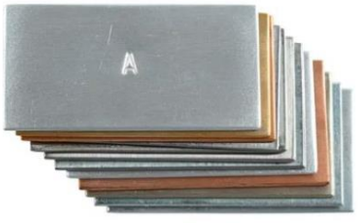
Dimensions of case : 320mm x 220mm x 50mm..

ESP59082

ESS Magnetism Kit

Kit include the following :
(01) Magnetic line simulation device Rubber hammer
(02) Earth model base Copper rod,d= 4mm,l=80mm Iron rod,d= 4mm,l=80mm Fiber rod,d= 4mm,l=80mm Stainless steel rod,d= 4mm,l=80mm Acrylic stick,d= 4mm,l=80mm Pin,4 bars Iron nail,20 bars Foam ball,2 bars
(03) Magnet,50*15*5mm
(04) Earth globe model
(05) compass,d= 60mm
(06) Iron powder
(07) Magnetic field sensor
(08) Rotating body
(09) Rotating body base
(10) Magnetic field demonstration disk
(11) Iron wire,l=40cm,10 bars
(12) Magnet,100*20*6mm
(13) Magnet,d= 10mm,l=100mm

ESP59080C



Metal Strips Set

A set of 12 metal strips for magnetism work. Each stamped with a key letter for identification. Ideal for experiments to demonstrate magnetic properties and classifications of metals. Size 50x25mm

The metal strips consist of:

Soft Aluminium, Brass, Copper, Mild Steel, Magnetic Stainless Steel, Non-magnetic Stainless Steel, Galvanised Steel, Hard Aluminium, Phosphor Bronze, Nickel Silver, Zinc Plated Mild Steel, Zinc

ESP59087

Iron Fine Powder 500g

ESP59108

Iron Filling In Bubble

ESP59109

Magnetic Field Demonstrator Set of 4 plates

4 transparent plates to demonstrate magnet fields
Each plate is 15.3cm x 7.6cm x 0.6cm - 98 chambers
Comprises a set of four transparent plastic plates 153 x 76 x 6 mm, each plate has a matrix of 98 (14 x 7) small circular chambers, each chamber containing an iron rod and functioning effectively as a plotting compass. The plates may be arranged in various ways, e.g. as a single large two dimensional surface, as faces of a cube etc., and in this way may be used to show configuration of a magnetic field in one or two dimensions. The transparent nature of the plates also makes them suitable for use on an overhead projector.

ESP59087

Force on Conductor App

comprising a strong U-shaped magnet and a pair of brass rails with 4 mm socket terminals. A brass axle with plastic discs is free to roll along the rails and completes the electrical contact between them. When the axle is placed on the rails between the poles of the magnet and power supply unit is connected, the axle is repelled and rolls along the rails away from the center of magnetic field.
Dimensions 175 x 60 x 58 mm

ESP59105

Iron Filings in Sprinkling Bottle

A Used to investigate pattern of magnetic field.
Size : Sprinkler bottle : Ø 45 × 83 mm
Weight Iron powder : 100 g -
Weight approx. : 150 g
Material : Sprinkler bottle : Plastic
Powder : Iron

ESP59107

Magnetic Field Demonstrator -3D

Allows students to observe magnetic fields in three as well as two dimensions. This unique device consists of two half hexagonal acrylic containers with metal filings. The two parts, connected with hinges, can be swung open or closed. A strong bar magnet is placed between the containers to reveal the cross section of a magnetic field.

Dimensions : 5 in. x 5 in. x 5 in.

ESP59085

Magnaprobe

This small magnet suspended in a gimbals mount shows forces between magnetic poles; induced magnetism; shapes of magnetic fields; direction of magnetic fields; and properties of a field produced by an electric current.

Dimensions : 118*37*3mm

ESP59088

Electromagnet U Form

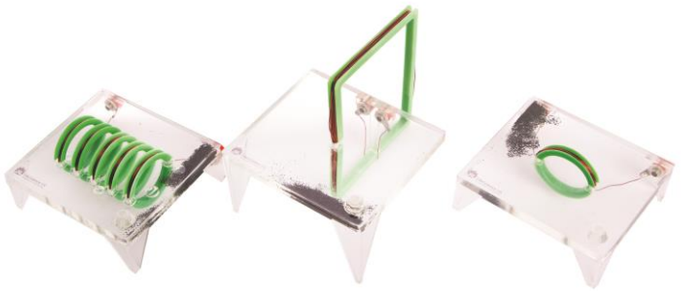
Iron, U core, circular section, with flat ends, has one bobbin in each limb wound with enamelled copper wire, with armature.

ESP59090

Magnet, Floating Ring Magnets

Demonstrate laws of magnetic attraction and repulsion. Consists of a stand with 5 magnetic rings sealed in plastic case to reduce wear and breakage.

ESP59093



Magnetic Field Demonstrator -Set Of 3

A conductor models in straight, loop and coil shape, embedded into temperature resistant nylon profiles, iron fillings in viscous medium in sealed acrylic cuvette

Dimensions of the cuvette : 107 x 96 mm

ESP59086

Magnaprobe, Big Demo

Magnetic field sensor, large This Large magnet suspended in a gimbals mount shows forces between magnetic poles; induced magnetism; shapes of magnetic fields; direction of magnetic fields; and properties of a field produced by an electric current

ESP59089

Globe For Magnaprobe, Big Demo , 200 mm

An illustration of the magnetic field around the earth as well as demonstrating inclination.

Coloured globe, made of robust plastic, labelled in English, pivoted appropriate slope, with sleeve for mounting a magnet 15x80mm; D=200 mm; (Delivered without magnet) Including Bar magnet, Alnico, 80x15 mm.

ESP59091

Magnetiser

• Devices that can penetrate strong magnetic fields to carbon steel's dense steel and insert or remove magnetic force

• It is magnetized by DC current and can be demagnetized by AC current. Experimental method

• When you want to insert magnetic force, put the sample into the bobbin of the magnetiser and place the switch in the magnetization position and push it 2-3 times at intervals of 0.5 ~ 1 second.

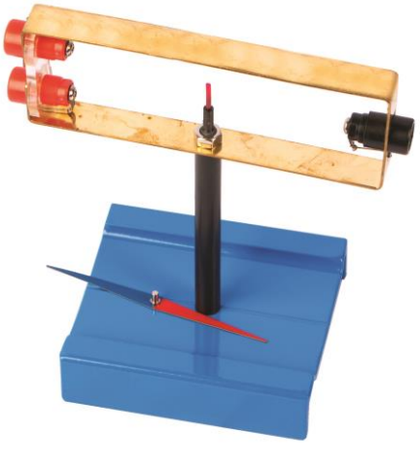
• In case of de-matching, put the switch in the demagnetizing position, push the push button as in the case of magnetization and take out the object slowly. Power AC220V, 2 magnetized balls

ESP59094

Lenz'S Law - Loop

To demonstrate Lenz's laws. The apparatus moves when a magnet passes through the closed loop and does not move the loop is open, proving Lenz's Law. Magnet not included.

ESP59098



Oersted's Apparatus

To show action of electric current on a magnet. A 75mm cobalt steel needle supported on a pivot is mounted on base and is surrounded by a copper strip rectangle with two terminals.

ESP59103

Metal Discs Set

For demonstrating that some metals are magnetic whilst others are not and for general 'Metal Identification' exercises. Comprises sixteen discs, 25mm dia. 2 each of Mild steel, Stainless Steel, Brass, Zinc, Nickel, Bronze, Aluminium and Copper. One of each is stamped with the name of metal, the other is unmarked.

ESP59096

Tangent Galvanometer

Used to demonstrate how a current loop generates a magnetic field. Consists of an acrylic hoop 12.7 cm in diameter wrapped with 2 coils of copper wire - one coil has 5 turns and the other 10, 3 binding posts which allow connections to 5, 10 or 15 turns and a compass.

ESP59100

Search Coil

Designed to comply with the new A Level curriculum in mind this new search coil consists of a 3300 turn bobbin mounted at the end of a 200mm long tube and allows the investigation of magnetic field strength. Two 4mm leads connect to any standard VOLTMETER (mV range required) or Oscilloscope to give an indication of the field strength.

ESP59106

Not Included

ESS Electricity Kit 2

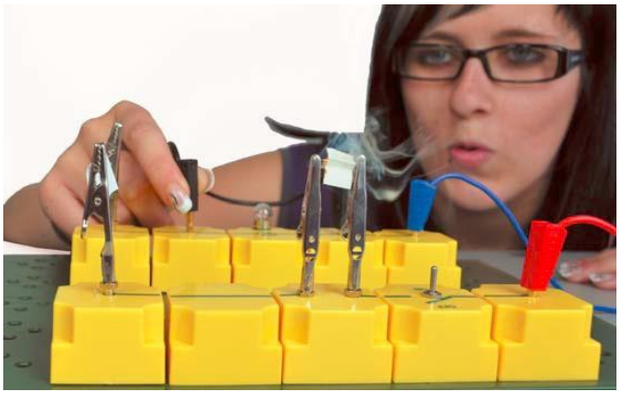
Kit consist of the following :
1 pc Connection plate plug in
1 pc Galvanometer (0+/-30) plug in
1 pc Ammeter (0-3/0.6A)Plug in
1 pc Mini motor mounted plug in
1 pc connection straight plug in
1 pc connection angle plug in
1 pc t connection plug in
2 pcs 2 mm sockets red plug in
2 pcs 2 mm sockets black plug in
1 pc LED plug in
1 pc switch plug in
1 pc 1.5 K ohm plug in
1 pc Simple Motor kit
1 pc Dynamo Model kit
1 set primary and secondary coil
2 pcs coils
1 pc stand alone Rheostat 20 Ohm
6 pcs connection wire with 2 mm plug red
4 pcs connection wire with 2 mm plug black
2 pc connection wire 2 mm plug / crocodile clip
4 pcs connection wire 2 mm plug / c connector
3 pc small lamp 0.8 V
3 Pcs iron rod
1 pc copper rod
20 pcs nails
1 pc Coil wire on transparent base
1 pc wire on base
1 set Electric bell model
1 Knife switch on base with 2 mm sockets
1 pc Battery holder AA Double 2 pcs mounted on one base 2 mm sockets
Press bottom switch mounted on base with 2 x 2mm sockets
1 pc Mini motor with 2 mm sockets
1 pc wire with base and 2 mm sockets
1 pc NS on base with 2 mm sockets

ESP59111

ESS Electricity Kit PC

This Kit Consist of the Following :
2 pcs Connection Board
5 pcs plug in connecting wire straight
5 pcs Plug In connecting wire angled
3 pcs Plug in T connection
2 pcs plug in 4 mm connection terminals (black and red) 1 2 mm plug in connection terminals (Black and red)
3 pcs 4mm connection terminal red
3 pcs 4mm connection terminal black
1 pc Single switch 2 pcs 3 way switch
1 pc NS Plug in
1 pc LDR Plug in 2 pcs lamp holder plug in
1 pc NTS Plug in box
1 pc PTC plug in box
1 pc 50 Ohm Resistor plug in
1 pc 100 Ohm Resistor plug in
1 pc 10 K Ohm Resistor plug in
1 pc 47 K Ohm Resistor plug in
1 pc Electric bill mounted
2 pcs battery holder
1 pc double battery holder mounted
2 pcs Multimeter
1 pc plug in Rheostat switch 200 ohm
1 pc plug in fuse holder
1 pc plug in mini Motor with fan
1 Pc Earthling model
100 pcs 0.1 A Fuses 100 pc 0.5 A Fuses
1 pc Electrolysis cell with plate
5 pcs crocodile clip red 5 pcs crocodile clip black
2 pcs 25 cm connection wire with 4 mm plug red
2 pcs 25 cm connection wire with 4 mm plug Black
3 pcs small lamp 6 V 0.7 A 3 pcs small lamp 2.5 V 0.3A
3 pcs small lamp 3.8 V 0.3 A 10 pcs fuses

ESP59110C

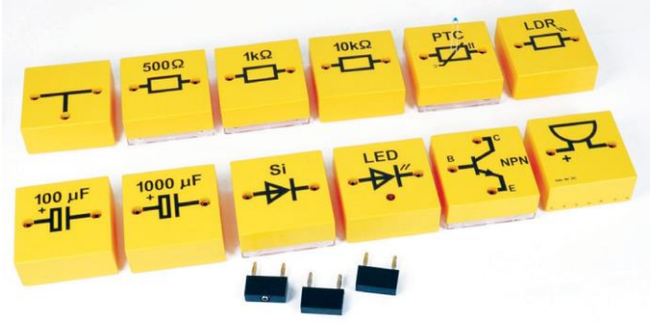


Student Electricity Kit

Kit consisting of:
1x Plug-in panel, small
2x Connecting lead, 25 cm, black
1x Connecting lead, 50 cm, red
1x Connecting lead, 50 cm, blue
1x Connecting lead, 75 cm, red
1x Connecting lead, 75 cm, blue
4x PIB connector
5x PIB wire, straight
2x PIB wire, straight, with socket
1x PIB wire, T-shaped, with socket
4x PIB wire, T-shaped
4x PIB wire, angled, with socket
2x PIB wire, angled
1x PIB wire, interrupted, with sockets
1x PIB switch, ON/OFF
2x PIB two-way switch
1x PIB resistor 100 Ohm
1x PIB resistor 500 Ohm
1x PIB resistor 1 kOhm
2x PIB battery (accu) 1.2V

2x PIB with adapter bush
2x PIB lamp socket E 10
1x Electrolysis tank
1x Conductors and non-conductors, set of
1x Electrodes, set of
2x Light bulb, 2.5 V/0.2 A, E10
2x Light bulb, 10 V/50 mA, E10
1x Fuse wire, D = 0.1 mm, bobbin red
1x Resistance wire, D = 0.2 mm, bobbin blue
1x Copper wire, D = 0.2 mm, bobbin black
4x Crocodile clip with plug
2x Holder with slit and hole, SE
Storage:
1x Box-insert Electricity 1, SE
1x Storage box II small, with cover,
Box -insert plan with 2 labels

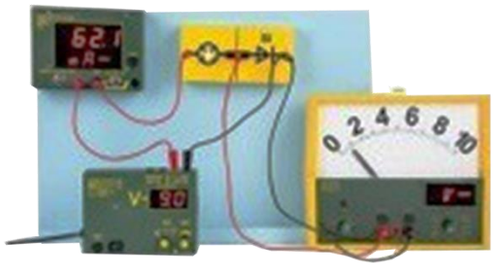
ESP59110



Electronics Basic Set «compact» (MBC)

consisting of:
1x MBC (Magnetic block) Lead., T-shaped
1x MBC Resistor 500 Ohm
1x MBC Resistor 1 kOhm
1x MBC Resistor 10 kOhm
1x MBC PTC-Resistor
1x MBC LDR-Resistor
1x MBC Capacitor 100 µF
1x MBC Capacitor1000 µF
1x MBC Si-Diode
1x MBC LED red
1x MBC Transistor NPN, base left
1x MBC Buzzer
2x Jumper plug MBC, black
1x Jumper plug with connector terminal
1x Storage box II small, with cover
Including manual for more than 20 experiments to the topics:
- Semiconductors
- Diodes
- Transistors
- Capacitors

ESP59113



Electricity Basic Set «compact» (MBC)

Robust plastic housing (ABS) with transparent bottom plate

- Circuit symbol (silkscreen printing)
- Suitable sockets for 4-mm safety plug
- Base plate with neodymium magnets
- **Dimensions :** 84 x 84 x 39 mm

consisting of:
2x MBC (Magnetic block) Lamp socket E10
1x MBC ON / OFF switch
1x MBC Resistor 5 Ohm
1x MBC Resistor 10 Ohm
4x Battery-Holder with outlets, magnetic
3x Clamp socket, magnetic, small
1x Fuse wire, D = 0.1 mm, L = 50 m, bobbin red
1x Constantan Wire, D = 0,2 mm, blue
1x Copper Wire, D = 0,2 mm, black
1x Conductors and non-conductors, set of 7 Stk.
3x Light bulb, 2.5 V / 70 mA (1.5 V / 50 mA), E10
3x Light bulb, 4 - 12 V / 40 - 70 mA, E10
2x Crocodile clip, plain metal
1x Tray for electrolysis
3x Connecting lead, 25 cm, red
3x Connecting lead, 25 cm, black
1x Connecting lead, 50 cm, red
1x Connecting lead, 50 cm, black
1x Storage box II small, with cover
Box-insert plan with 2 labels

Including manual for more than 20 experiments such as:
- Basics of electricity
- Electrical resistance
- Therman energy derived from electrical energy
- Work and power

ESP59112

Bottom-shelf for MBC system

Powder-coated metal plate for experiments in electricity or electronics as a "compact" system
Free experimental area: approx. 50 x 33 cm

ESP59114

Ohm's Law Experiment Kit
ESP59457

Senior High School

- Ohm's Law states that the current through a conductor between two points is directly proportional to the voltage across the two
- points. This proportionality between voltage and current is known as resistance.
- This kit is designed to tangibly observe Ohm's Law by observing the correlation between current magnitude and voltage between two points in a few types of conductor.
- This experiment also reveals that different type of conductors with equal dimension will have different resistance value.

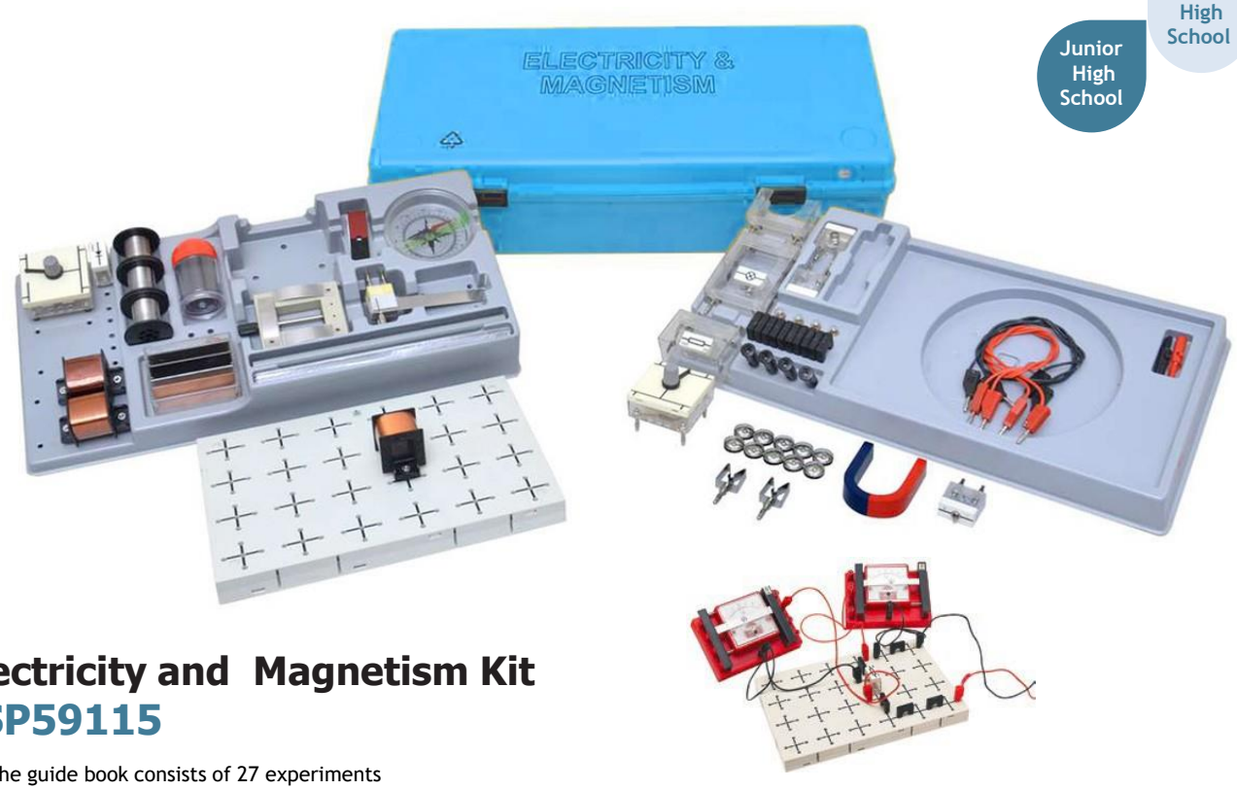
Component List

Consisting of 4 components, packed in a plastic injection moulding box.
Dimension: 62 × 30× 9 cm. Weight: 2.880 kg.

Cat. code	Component	Description	Qty
ESP 150	Ohm's Law Model	Can be used to show data on the relationship between current and voltage. There are three wire resistance and shear resistance with a total resistance of 300 Ohms. Equipped with 6V internal power source.	1 pc
ESP 000314	Connecting Lead DC 50 cm, Blue	Cable with a total length of 500 mm and maximum current of 8 A. Color: blue.	2 pcs
ESP57915	Connecting Lead DC 50 cm, Black	Cable with a total length of 500 mm and maximum current of 8 A. Color: black.	2 pcs
ESP57914	Connecting Lead DC 50 cm, Red	Cable with a total length of 500 mm and maximum current of 8 A. Color: red.	2 pcs

Junior High School

Senior High School



Electricity and Magnetism Kit
ESP59115

- The guide book consists of 27 experiments
- The experiments are related to the basic circuit, electrical resistances, electrical energy and power, magnetism and electromagnetism.
- The electronic components are mounted inside transparent box section, completed with corresponding symbols. The boxes are equipped with standard 4 mm banana plugs in 19 mm distance.

Component List

Consists of 39 components, packed in a plastic injection moulding box.
Dimensions: 61 x 26 x 17 cm. Weight: 4.7 kg.

Cat. code	Component	Qty
FLS 20.01/096	Assembly Board 120 Holes	1 pc
FLS 20.02/097	Bridge Connector	10 pcs
FLS 20.03/300	Alligator Clip, Red and Black	2 pcs
FLS 20.05/102	Change Switch	2 pcs
FEM 21.00	U and I Core	1 pc
FEM 21.01/250	Coil 250 Turns	1 pc
FEM 21.01/500	Coil 500 Turns	1 pc
FEM 21.01/102	Coil 1000 Turns	1 pc
FLS 20.11/109	Clamp Plug	1 pc
FLS 20.12/110	Spring Plug	4 pcs
FLS 20.14/114	Rectangular Bar Magnet 6 x 19 x 70 mm, Red-Black	2 pcs

Cat. code	Component	Qty
FLS 20.18/116	Zinc Electrode	1 pc
FLS 20.19/117	Steel Electrode	1 pc
FLS 20.20/118	Lead Electrode	1 pc
PEO 341 04	Resistor 4.7 Ohm, 2W	1 pc
FLS 20.22/047	Resistor 47 Ohm, 2W	2 pcs
PEO 341 07	Resistor 56 Ohm, 2W	2 pcs
FLS 20.22/100	Resistor 100 Ohm, 2W	2 pcs
PEO 372 01	LED, Red	2 pcs
FLS 20.04/101	Single Polar Switch	1 pc
FLS 20.07/104	Lamp Bulb E 10, 6V/3W	1 pc
FLS 20.07/103	Lamp Holder E 10, Lateral	2 pcs

Physics Experiment Kit

Cat. code	Component	Qty
FLS 20.30/125	Iron Powder	1 roll
PEF 320	Plotting Compasses, Plastic	1 bottle
ESL57901	Battery Holder	4 pcs
ESP57914	Connecting Lead DC 50 cm, Red	2 pcs
ESP57915	Connecting Lead DC 50 cm, Black	2 pcs
ESP 20.40/141	PVC Rod	2 pcs
ESP 316	PVC Rod with Metal Axle	2 pcs
ESP 20.41/142	Plexiglass Rod	1 pc
ESP 317	Plexiglass Rod with Metal Axle	1 pc
ESP 241 01	Wool 200 x 200 mm	10 pcs
ESP 241 02	Silk 200 x 200 mm	1 set
ESP 200 05	Electrical Motor/Generator DC	1 set

Experiment Topics

LP 1 Closed Circuit I
LP 2 Closed Circuit II
LP 3 Closed Circuit III
LP 4 Conductor and Non Conductor Resistance
LP 5 Serial and Parallel Battery Configurations
LP 6 Current Measurement-Voltage Measurement I
LP 7 Current Measurement-Voltage Measurement II
LP 8 Kirchoff Law I
LP 9 Ohm's Law
LP 10 Resistance of Wires
LP 11 Serial Connection Resistance
LP 12 Parallel Connection Resistance
LP 13 Electric Energy Changes Being Heat
LP 14 Fuse Model
LP 15 Electrical Power
LP 16 Magnetism
LP 17 Strength and Magnetic Interactions
LP 18 Combined Magnet
LP 19 Magnetic Field I
LP 20 Magnetic Field II
LP 21 Magnetics Field of Current Flow
LP 22 The Magnetics Field of a Coil
LP 23 Electromagnet
LP 24 Lorentz Force
LP 25 Electric Motor
LP 26 Electromagnetic Induction
LP 27 Electrics Generator

Supporting Components

Available in the Mechanic kit PMS 107.

Cat. code	Component	Qty
ESP 180	Stand Base with 3 Clamps	2 pcs
ESP 51.02/02	Stand Foot	2 pcs
ESP 30/250	Stand Rod Ø 10 x 250 mm, Stainless Steel	2 pcs
ESP 30/500	Stand Rod Ø 10 x 500 mm, Stainless Steel	2 pcs
FME 51.08/09	Nylon Thread	1 roll
PS000 5218.1 17/26	Plastic Pole	2 pcs
	with Ø P l1u0g0 mm, Red	1 pc
ESP 51.18/28	Coupling Rod	2 pcs

Available in Hydrostatics and Heat Kit PHK 107.

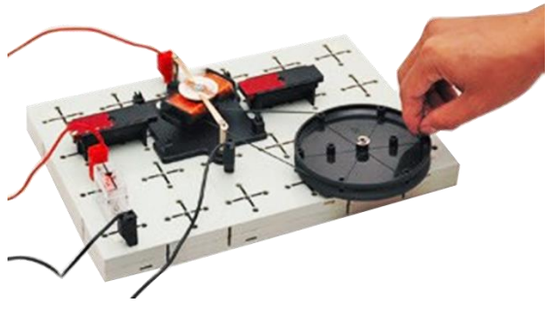
Cat. code	Component	Qty
ESL57103	Universal Clamp With Bosshead Ø 70 mm	2 pcs
ESL57578	Alcohol Thermometer -10°C - 110°C	1 pc

Supporting Tools

For detailed information, please refer to page 70 - 73.

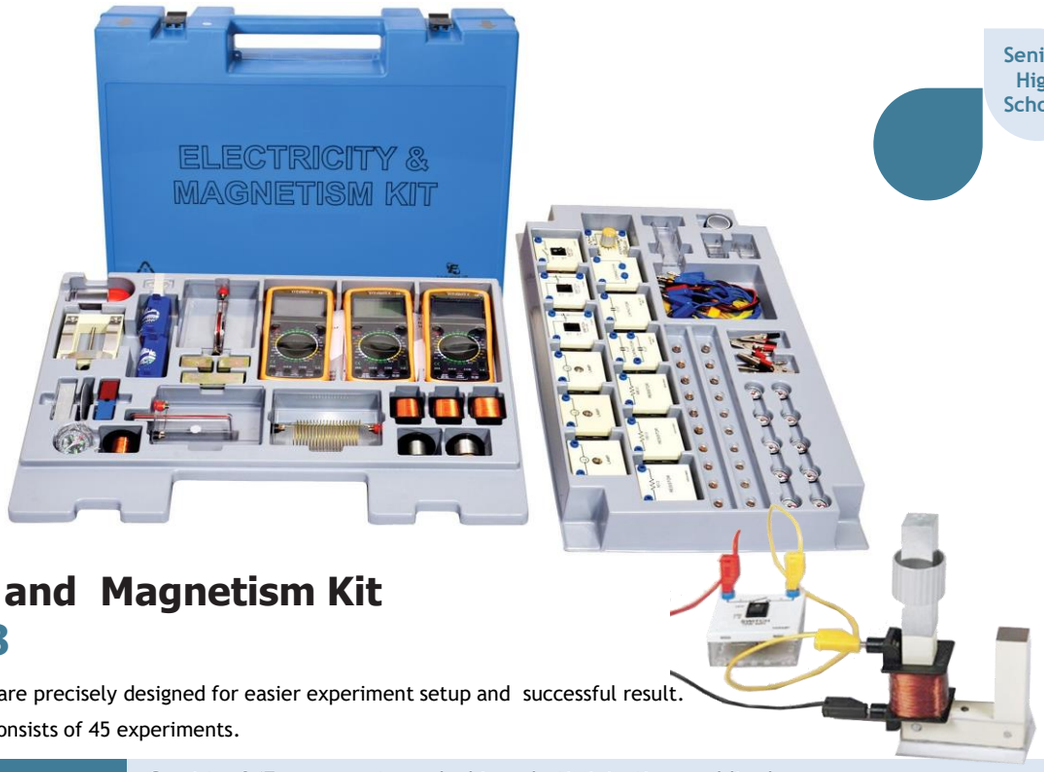
Cat. code	Component	Qty
ESP60751	Power Supply	1 pc
ESP 45	Analog Multimeter	1 pc
ESP59449	Ammeter/Voltmetre 2-1	2 pcs

LP 10 Ohm's Law



LP 28 Electric Generator

Senior High School



Electricity and Magnetism Kit

ESP59118

- The apparatuses are precisely designed for easier experiment setup and successful result.
- The guide book consists of 45 experiments.

Component List

Consists of 47 components, packed in a plastic injection moulding box.
Dimensions: 61 × 44 × 16 cm. Weight : 7.95 kg.

Cat. code	Component	Qty
ESP332559 01 01	Pote5n0t iOomhmet,e 5r, W50 R Ωe s istor	1 pc
ESP 359 02	100 Ohm, 5 W Resistor	1 pc
ESP 351 07	500 Ohm, 5 W Resistor	1 pc
ESP 403 01	5 µF, 50 V Capacitor	1 pc
ESP 403 02	10 µF, 50 V Capacitor	1 pc
ESP 504	Lamp Holder	3 pcs
ESP 502	SPST Switch	1 pc
ESP 502	SPST Switch	2 pcs
ESP 501	Connector Box	1 pc
ESP60750	Power Supply 5 A, 12 V	1 pc
ESP 221 01	Cell Holder	2 pcs
ESP 000306	Connecting Leads, 250 mm, Yellow	3 pcs
ESP 000303	Connecting Leads, 250 mm, Bleu	3 pcs
ESP57915	Connecting Leads, 500 mm, Black	1 pc
ESP57914	Connecting Leads, 500 mm, Red	1 pc

Cat. code	Component	Qty
PS 000314	Connecting Leads, 500 mm, Blue	2 pcs
PS 000316	Connecting Leads, 500 mm, Yellow	2 pcs
PEF 331	U and I core	1 pc
PEF 355	Coil with 150 turns	1 pc
PEF 356	Coil with 500 turns	1 pc
PEF 357	Coil with 1000 turns	1 pc
PEF 333 01	Base for Aluminum disc	2 pcs
PEF 332	Solid Iron Core	1 pc
PEF 333 02	Aluminum Disc and Axle	1 pc
PEF 331 04	U-Core Foot	1 pc
GME 240 03	Digital Multimeter, DT 9205A	3 pcs
FLS 20.14/113	Bar Magnet, ALNICO, Red-Blue	1 pc
PEF 291	Circular Conductor	1 pc
PEF 290	Straight Conductor	1 pc
PEF 292	Solenoid Conductor	1 pc
FLS 20.30/125	Sprinkler Iron Filling	1 pc

Physics Experiment Kit

Cat. code	Component	Qty
PEF 320	Plotting Compasses, Plastic	10 pcs
KAL 70/025-05	2.5 V, 0.5 A E10 Lamp Bulb E10	1 pack
KAL 70/120-50	12 V, 3 W E10 Lamp Bulb	10 pcs
PEO 483 04	Copper Wire, Ø 0.35mm	1 pc
PEO 481 04	Constantan Wire, Ø 0.35 mm	1 pc
KAL 92/200	Fuse Wire	1 pc
GLA 015	Pin	4 pcs
GLA 016	Paper Clips	2 pcs
PEO 460 02	Alligator Clips with Plug, Black & Red	4 pcs
PEO 460 01	Alligator Clips with Socket, Black & Red	4 pcs
PED 135 02	Copper Electrode	1 pc
PED 130 02	Zinc Electrode	1 pc
PED 132 02	Conductivity Plate	2 pcs
PEF 333 03	Thompson's Ring	1 pc
FMA 58	Compass	1 pc

Experiment Topics

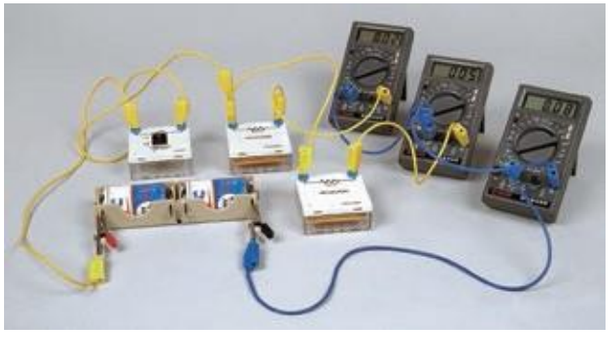
Fundamental Principle

LU-1 Simple Circuit
LU-2 One Way and Two Way Single Pole Switches
LU-3 Circuit to Turn on a Lamp From Two
LU-4 Switches Measuring Voltage. The Voltmeter
LU-5 I Measuring Voltage. The Voltmeter II
LU-6 Measuring Current. The Ammeter
LU-7 Conductor and Non Conductors Conducting
LU-8 and Non Conducting Liquids I Conducting
LU-9 and Non Conducting Liquids II

Electric Resistance

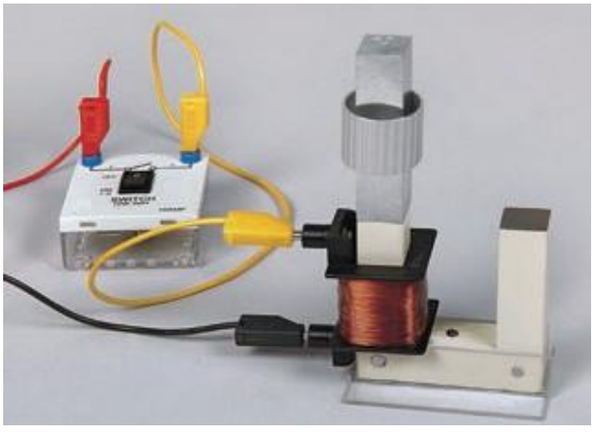
LU-10 Ohm's Law
LU-11 Using Ohm's Law to Determine Resistances The
LU-12 Resistances of a Lamp
LU-13 Lamps in Series and Short Circuit
LU-14 Resistors in Series
LU-14a Resistors in Series II Lamps
LU-15 in Parallel Resistors In
LU-16 Parallel
LU-17 Combined Series and Parallel Connection of Resistors
LU-18 Internal Resistance of Dry Cell
LU-19 The Voltage Divider
LU-20 The Potentiometer as Voltage Divider
LU-21 Rheostat (Variable Resistor)

LU-2 One Way and Two Way Single Pole Switches



LU-16 Resistors In Parallel

LU-33 Electromagnets



LU-43 Thompson's Ring

Physics

Physics Experiment Kit /

Electrical Energy and Power

LU-22 Heat Energy from Electric Energy
LU-23 Light Energy from Electric Energy
LU-24 Making a Fuse
LU-25 Power in Electric Circuit
LU-26 Heater
LU-27 Electric Energy Consumed by a Water Heater

Electrochemistry and Capacitor

LU-28 Voltage Generator by Metals Immersed in Electrolyte Solution
LU-29 Capacitors

Electromagnet

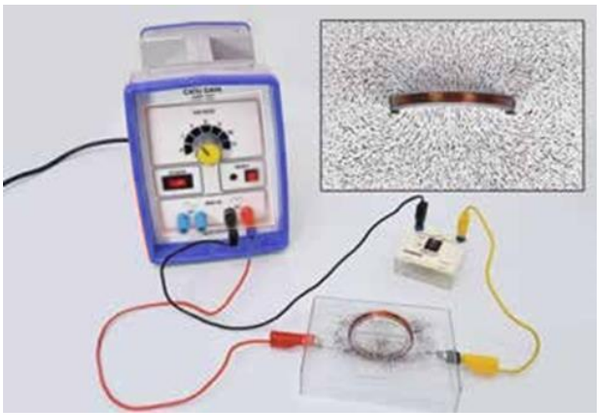
LU-30 Magnetic Field Around a Straight
LU-31 Wire Magnetic Field Around a
LU-32 Circular Wire Magnetic Field Around
LU-33 a Solenoid Electromagnets

Electromagnetic Induction

LU-34 Electromagnetic Induction
LU-35 Electromagnetic Induction II
LU-36 Laminated and Not Laminated Iron
LU-37 Core Useful Eddy Current
LU-38 The Transformer

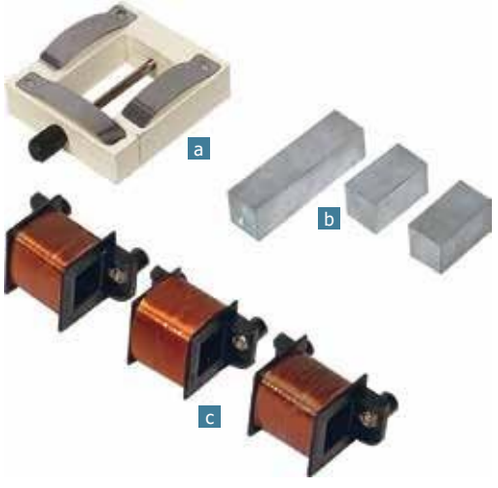
AC Circuit

LU-39 Alternating Voltage and Current
LU-40 Capacitive Reactance
LU-41 Inductive Reactance
LU-42 AC Magnetizing Current
LU-43 Thompson's Ring
LU-44 RC and RL Series in AC Circuit. Phase Difference



LU-31 Magnetic Field Around a Circular Wire

LU-28 Voltage Generator by Metals Immersed in Electrolyte Solution



Component Details

Core and Coil

a. Set of I and U core (ESP 331) is laminated iron core, completed with lock bolt and spring plate to lock the coil.
b. Set of solid iron core (ESP 332) is non laminated solid iron core, consisting of 1 long I core and 2 short I cores.

c. The150 turns (ESP 355), 500 turns (ESP 356), and 1000 turns (ESP 357) coils can be combined to produce a model of step-up and step-down transformer.

Section Box Component

The components are mounted on a plastic house with 4 mm socket. These are connected using a Connecting Leads to form a circuit.

Plastic house: 64 × 64 × 28 mm

- Potentiometer, 50 Ω (PEO 325 01)
- Resistor, 50 Ω (PEO 359 01)
- Resistor 100 Ω (PEO 359 02)
- Resistor 500 Ω (PEO 351 07)
- Capacitor 5 micro F (PEO 403 01)
- Capacitor 10 micro F (PEO 403 02)
- Lamp holder (PEO 504)
- Switch, SPST (PEO 502)
- Switch, SPDT (PEO 503)
- Connecting box (PEO 501)

Magnetic Field Observation Tools

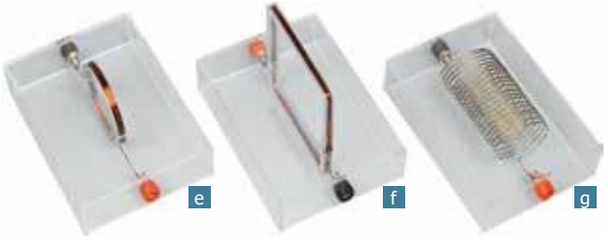
a. Iron powder (ESP 20.30/125).
b. Alnico bar magnet (ESP 20.14/113).
c. Compass (ESP 58).
d. Plotting compass (ESP 320).

Battery Holder (ESL57901)

This is the holder for D sized battery, designed to build series and parallel connection.

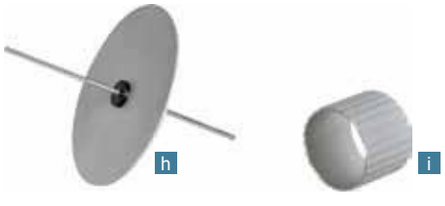
Conductor and Solenoid

These are to observe the magnetic field on powered conductor. These tools are mounted on transparent box to put on an overhead projector to get enlarged view of the produced magnetic field pattern.



e. Straight conductor (PEF 290).
f. Circular conductor (PEF 291).
g. Solenoid (PEF 292).

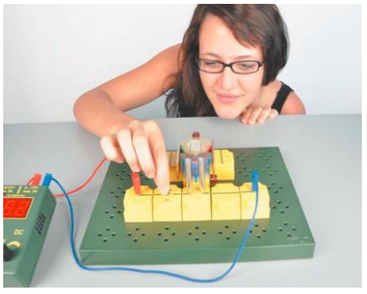
Aluminum Disc with Axle and Thompson Ring



h. Aluminum disc with axle (PEF 333 02): disc diameter is 70 mm, 100 mm axle length, used for Eddy current concept experiment.
i. Thompson ring (PEF 333 03): 32 mm diameter, 25 mm long, used for Lenz's Law concept experiment.

Connecting Cable

- Fibrous cables with 4 mm banana plugs.
- Red and black colored cables are used for power supply connection. Yellow and blue colored cables are used for component connection in a circuit.
- Available in the length of 250 and 500 mm.



Student Electromagnetism Kit

Kit consisting of:
1x PIB (Plug in Board) with heating coil 1x PIB glow lamp
1x PIB pushbutton
1x Iron core solid, L=50 mm 1x Contact pin SE
2x Pole lamination SE, 60 x 25 mm 2x Commutator brush
1x Magnet holder
1x Commutator disc
1x Collecting ring disc 1x Bimetallic strip
1x Flat spring steel, 0.2 mm 1x Flat spring brass
1x PIB motor
1x PIB for coil 800 turns
1x PIB for coil with 2?800 turns 1x Coil with 800 turns, blue
1x Coil 2 x 800 turns, red 1x Iron core laminated 2x Bearing pin

Storage:
1x Box insert Electromagnetism 1x Storage box II mini, with cover, Box - insert plan with 2 labels

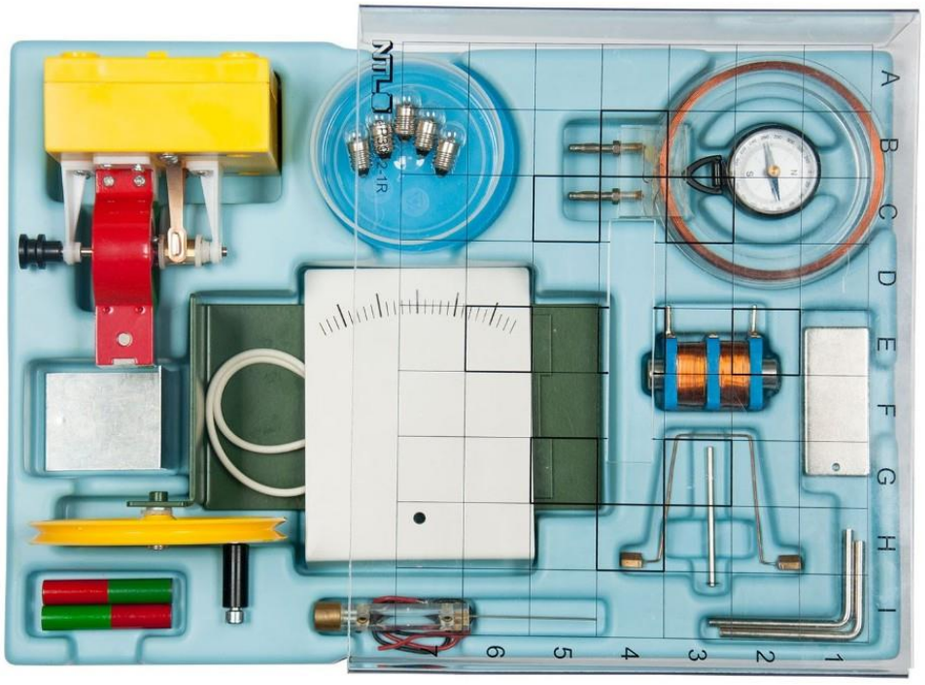
ESP59119

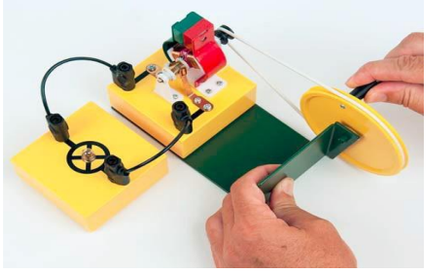
Experiments :

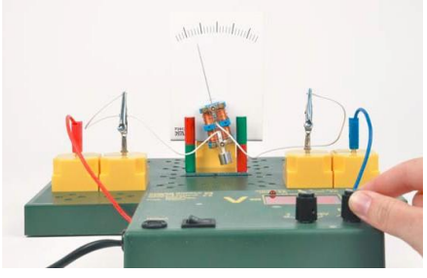
3. THERMAL ENERGY FROM ELECTRICAL ENERGY
ELS 3.6 Bimetal fuse
ELS 3.7 Bimetallic thermostat
ELS 3.8 Bimetallic fire alarm
4. WORK AND POWER ELS
4.1.1 The power of an electric motor
6. ELECTROMAGNETISM ELS
6.1 Electrical current generates a magnetic field
ELS 6.2 The magnetic field of a coil
ELS 6.3 A magnetically manipulated switch
ELS 6.4 A relay
ELS 6.5 Relay with operating point and normal contact
ELS 6.6 Self-opening switches
ELS 6.7 An AC buzzer
ELS 6.8 Model of a magnetic fuse
7. KINETIC ENERGY FROM ELECTRIC ENERGY
ELS 7.1 Electricity used to generate motion
ELS 7.1.1 Lorentz force
ELS 7.2 Principle of the electric motor
ELS 7.3 Model of the electric motor
ELS 7.3.1 Direct current motor
ELS 7.6 Model of a moving iron measuring instrument
8. ELECTROMAGNETIC INDUCTION
ELS 8.1 Induction
ELS 8.1.1 Induced electromotive force
ELS 8.2 Principle of a generator
ELS 8.3 The AC generator (internal pole generator)
ELS 8.4 The AC generator (external pole generator)
ELS 8.5 The DC generator
ELS 8.6 Generators with electromagnets
ELS 8.6.1 Internal pole generator with electromagnet
ELS 8.7 Induction by DC
ELS 8.8 Transformer
ELS 8.9 Transformer 1:1
ELS 8.10 Transformer not under load
ELS 8.11 Current intensity is also transformed
ELS 8.12 Coils under DC
ELS 8.13 Cut-out peaks due to self-induction
ELS 8.13.1 Lenz's Law
ELS 8.13.2 Braking effect due to self-induction
ELS 8.14 Coils under AC
ELS 8.15 AC resistance of a coil
ELS 8.16 Resistance and inductance in AC

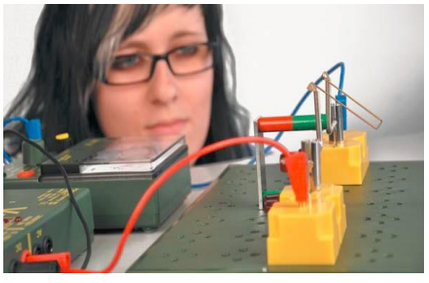
Important Note :

to do the above written experiments you will need to order Accessories and 2 additional kits :
Student Magnetism kit # ESP59080
And the Student Electricity kit # ESP59110









Student Electrodynamics Kit

Kit consisting of:
1x Axis for moving coil
1x Pointer for moving coil
1x Pole lamination , 60 x 25 mm 1x Motor/Generator Model
2x Bar Magnet, AlNiCo, D=10 mm, L=50 mm 5x Light bulb, 4 V/40 mA, E10
1x Moving coil with hole, blue 1x Iron core solid, L=50 mm 1x Electromagnetic swing
2x Electrode, right angled
1x Holder for pocket compass 1x Induction coil
1x Pocket compass
1x Scale for moving coil

Storage

1x Box insert Electrodynamics
1x Storage box II small, with cover, Box -insert plan with 2 labels

Experiments :

MAGNETIC FIELD OF A COIL
EMS 1.1 The magnetic field and its field lines around a powered coil
EMS 1.2 The influence of the coil current on the direction of the magnetic field
EMS 1.3 Relation between amperage and the tangent of the deflection angle
THE MAGNETIC FIELD OF THE EARTH EMS 2.1 Determining the magnetic field force of a coil and defining the horizontal component of the earth's magnetic field
KINETIC ENERGY FROM ELECTRIC ENERGY
EMS 3.1 The basis for electric motor and generator as an interaction
EMS 3.2 Current flow and deflection of a current-carrying conductor in a magnetic field ("right-hand rule")
EMS 3.3 Coil in a magnetic field (rotating-coil device)
MOTOR / GENERATOR (COMPACT MODEL)
EMS 4.1 Simple DC motor
EMS 4.2 Series motor
EMS 4.3 Shunt-wound motor
EMS 4.4 DC generator - external pole generator

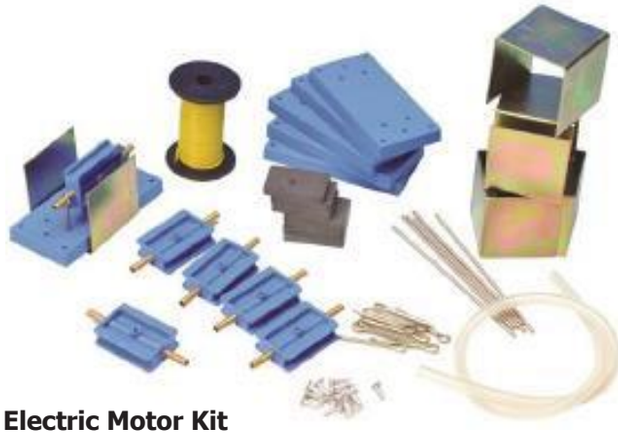
ESP59120

Electromagnetism

Electromagnetic Kit Simple

Comprises of 8 ticonal magnets, 8 magnadur magnets, 4 steel yokes, 4 plotting compasses, 4 formers of compasses, 1 bottle fine iron filling (approx. 500g), 4 each double C-cores, 4 clips for C-cores, 2 aluminium rings, 2 split aluminium rings, 4 support bases, 4 armature with axle rods, 8 split pins, 24 rivets, 1 length rubber tubing, 4 formers for coils, 2 rolls of cello tapes, 4 reel of copper wire, 4 sheets plain postcards, 1 reel white cotton, 4 each carbon resistors of 10 ohm & 10 ohms, 8 flash lamp bulbs, 5 neon bulbs, 8 M.E.S. bulb holders, 1 wooden clamp and 4 wooden rods

ESP59092



Electric Motor Kit

the kit comprises all the part required to build 6 model motors as in the electromagnetic kit. Each kit contains 12 pieces of magnets, 6 pieces of armatures, 6 pieces of mild steel yokes, 6 pieces of support bases, 6 pieces of shaft, 24 pieces of rivets, 12 pieces of split pins, 1 reel of 26 s.w.g. PVC tinned copper wire, 2 reels of cellotape, 300 mm rubber tubing of 3 mm bore.

ESP59126

Chart for Electromagnetism

ESP59121

NEW

Audio Frequency Amplifier

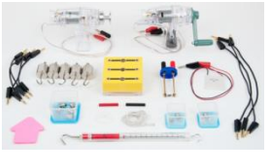
Amplifier one channel which is equipped with microphone amplifier and major output regulator.

• Mode/power output : Mono/10 W • Input impedance (IN) : 600 ohm • Output impedance : 8 ohm • Working voltage amplifier : ± 18 VDC/220 VAC • Features : Microphone mode (Condensor/Dynamic), MIC Input, Volume Control, Power switch, Fuse 0.75 A, Connecting cable AC, AC connector selector, and Output • Size : Overall 185 x 130 x 75 mm.

ESP59126

NEW

Power, Work and Efficiency Kit



Experiments
Electric energy transfer
Power consumption of light bulbs
Power of light bulbs
Power of a motor
Parallel connection of electrical loads
Series connection of electrical loads
Model of a small electric stove
Model of a small cooling plate
Heating or cooling by electrical work
Mechanical work
Mechanical work by electrical power
Comparing mechanical work with electrical work
A special electrical brake
Hand generator with controller
Gear wheel for hand generator (spare) 1
Hand motor with controller and pulley 3
Connecting lead, 25 cm, black, SE 4
Connecting lead, 10 cm, black, SE 1
BC Lamp socket E 10, triple 2
Filament light bulb, 6 V/0.1 A, E10 2
Sample box with lid, plastics, 30 ml, 35x35x33mm 5
Filament light bulb, 6 V/0.3 A, E10 1
Double socket, insulated, black 1
Double socket, insulated, red 1
Sample box with lid, plastics, 80 ml, 50x50x40mm 2
Filament light bulb, 6 V/0.5 A, E10 1
Cord, 150 cm, with loop 5
Weight on hook 100 g, plated 1
Heating spiral, SE
Peltier element with 2 plugs
Dynamometer 2 N, transparent 1
Labels adhesive, pack
Storage: 1 - Box insert Power, Work and Efficiency 1
Storage box II small, with cover
Box insert plan with 2 labels"

ESP59127

Bridge Rectifier

Bridge Rectifier consists of four diodes connected in a bridge circuit. The most common application of this circuit is the conversion of alternating current (AC) input into direct current (DC) output. Available in three current ratings

The unit has a circuit diagram printed so that student may gain an appreciation of the importance of diodes and how they can rectify alternating current to direct current.

Current : 5 Amp / 100 V

ESP59122

Electrical Motor

Part of Electricity Kit. Dimension 6.5cm (L) x 2.80cm (W) x 8.20cm (H). Weight 0.118kg

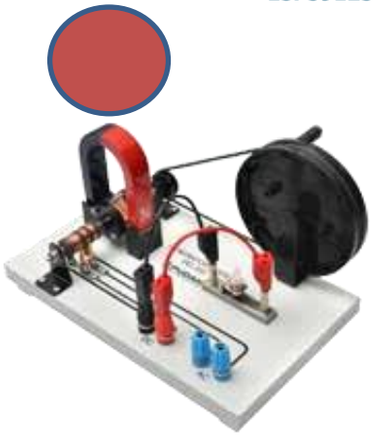
ESP59123

Electric Motor

An electric motor model with commutator.
All parts are visible including the magnet
It runs on 1.5 - 6 V DC supply
Complete with 4mm socket terminals
Dimensions : (L) 11.5 x (W) 7.5 x (H) 3.00cm
Weight : 0.058 kg

ESP59124

Generator Model



This generator model can be used to show the motion of energy transformed into electric power or vise versa. This AC / DC generator model is hand operated. Exposed construction to show the working mechanism. Magnetic field comes from removable U magnet. Terminals are 4mm screwed sockets. The whole components are mounted on wooden base, dimension 25 × 25 cm.

ESP59132

Spare Belt for Motor

ESP59133

Mini Motor DC

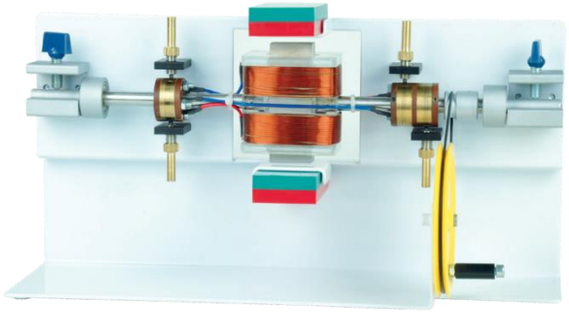
This little yet powerful motor is idea for hundreds of electrical experiments and projects.

ESP59128 Voltage requirements : 1.5V ~ 4.5V, 0.2A
ESP59129 Voltage requirements : 3V ~ 6V, 0.2A
ESP59130 Voltage requirements : 6V ~ 12V, 0.2A

NEW

Demo Transformer Basic Set

ESP59134



Motor - Generator unit, Demonstrator

Large, ready-to-use working model of a motor / generator. Thanks to the open front design, students can clearly see how the parts of the model work even from a large distance. Power is supplied by elastic carbon brushes on the commutator or slip rings. The removable rotor (length: 356 mm) runs on two ball bearings. On the bottom there is a large drive pulley with a crank and belt.
Comes with two plastic-coated plate magnets, 82 x 42 x 18 mm.
Dimensions : 360 x 110 x 180 mm

ESP59131

NEW

Demo Transformer Student Set

These high-quality coils and laminated iron cores provide an effective introduction to electromagnetic theory. Purchase them individually or as a complete set. The coils are color-coded and each coil is labeled with the number of turns and the direction of the winding. Use them to investigate: Electromagnetism: Show how the magnetic field can be increased by increasing the current, by adding an iron core, or by using a coil with more turns.

ESP59134ST

Electric Motor Simple

This simple motor kit is easy to build, and demonstrates the basic principles of electromagnetism. The directions are complete, easy-to- follow, and include a short explanation of the working of the motor. Battery not included. Product contains a small magnet. Magnets and metal objects sticking together inside a body can cause serious damage. Seek medical help if a magnet is swallowed. Grades 3+

ESP59125

U And I Core

Used for assembly of electromagnetic model for several applications such as transformer, generator, motor, relay, counter, etc.

Dimensions : 76 x 18 x 115 mm (assembled), Material: Dynamo lamination sheet,Consists of U and I core, completed with clamping screw, **Dimensions :** (L) 10.50 x (W) 7.00 x (H) 2.00cm

ESP59135

COIL Size : Overall 56 x 48 x 38mm

Hole: 34 x 23mm

Used to basic principles transformer alternating current (AC) and various experiments in both electromagnetic current (DC). It has smaller electrical currents

Material: Coil holder made of plastic

ESP59139	1200 TURNS	**Dimensions :** (L) 6.10 x (W) 5.00 x (H) 4.00cm, **Weight :** 0.160kg
ESP59140	3600 TURNS	**Dimensions :** (L)5.40 x (W) 4.30 x (H) 3.30cm, **Weight :** 0.045kg

Core Clamp, Demountable

This clamp is used to clamp together the I and U cores and the coils. Overall

Dimensions : 200 x 190 x 160mm Material: - Body : Cast iron, - Locking bolts: Brass plated EduScience, High clamping jaws can be adjusted as needed, Used with U and I Core, Demountable and Coils Demountable ,

Dimensions : (L) 19.00 x (W) 20.00 x (H) 15.50cm

ESP59152

Solenoid

Diameter 50 mm 270 turns wire 1.25 mm in diameter. Max. Current : 6A Power Supply on 2 safety sockets. Length 370 mm

ESP59153/270

COIL Size: 64 x 53x 40mm

Copper wire coil on hard plastic base with 4mm plug terminals to mounted on Assembly Board

Can be mounted on U-core and I-core

Can be installed on the assembly board ad assembly with U-I core built trafo with voltage comparator same with winding ratio

Plastic base is marked with coil turn direction and number of turns

Dimensions : (L) 6.50 x (W) 4.00 x (H) 6.00

ESP59136	1000 TURNS	Copper wire Dia 0.5mm, **Weight :** 0.190 kg
ESP59137	250 TURNS	Copper wire Dia 0.9mm , **Weight :** 0.116 kg
ESP59138	500 TURNS	Copper wire Dia 0.5mm , **Weight :** 0.116 kg

Coil , Demountable Size approx. 108 x 71 x 81mm

Used to basic principles transformer alternating current 9AC) and various experiments in both electromagnetic direct current (DC). The body coil using plastic Complete with 4mm socket terminal used in conjunction with the Core Clamp (ESP59152) and The Cores

	Turns, Demountable	Wire: Dia	Weight wire
ESP59141	120	1.8mm	450gr
ESP59142	300	1.2mm	500gr
ESP59143	1000	0.8 mm	760gr
ESP59144	2400	0.5 mm	700gr
ESP59145	3600	0.4 mm	850gr
ESP59146	60-0-60	1.8 mm	450gr
ESP59147	120-0-120	1.2 mm	395gr
ESP59148	500-0-125	1.0 mm	750gr
ESP59149	1200-0-1200	0.5 mm	700gr”
ESP59150	1500-0-500	0.6 mm	880gr
ESP59151	5000-0-250	0.35 mm	750gr

Solenoid Multi Turns

made of Two rollings Ø 50mm of copper wire Ø1mm enameled 200 turns isolated on the same support. Intermediate outputs (blue sockets) 5, 10, 20, 30, 50, 70 and 100 turns. ;Max. intensity: 7A.· ;can be used to Perform the following experiments :

·Measures of magnetic fields according to different parameters

·Magnetic field formula

ESP59153

Faradays coil

To show electromagnetic induction generated secondary coil by variation of current in a primary coil
The primary coil
Dimensions : dia 24 x 60mm
The primary coil has 43 windings of copper wire which can carry a current of up to 5A and has a resistance of 0.15 ohm
The second coils has 1300 windings of copper wire which can carry a current of 0.2A and has resistance of 75 ohm
Provided with a soft iron core measuring 120 x dia 11mm
Dimension: (L) 10.00 x (W) 10.00 x (H) 14.00cm
Weight: 0.349 kg

ESP59154

Current Balance Apparatus

Very clear, robust and compact model of a current balance for determining the force of a
current-carrying straight conductor in a homogeneous magnetic field (Lorentz force), as a
function of the conductor length and the current intensity;
electrical conductors with single and double cross-section, mounted on three safety sockets, fixed in a transparent retaining bracket.
Conductor cross-section: 8x2 mm, Conductor length: 35 mm each
Strong block magnet (80x40x15 mm) with two pairs of pole plates to generate different
homogeneous magnetic fields, embedded in a hard foam plate.
Dimensions: 110x100x135 mm, Mass: approx. 600 g
Additionally required: ESL57662
digital balance 06, 500/0,01 g

ESP59155

Induction Coil, Superior

This induction coil is capable of producing a spark with an input of 6 to 12 V DC and is therefore ideal for use with vacuum tubes, audiometers etc. A fully adjustable vibrator system is incorporated and spark suppression capacitors are housed in the base. A pair of pointer electrodes are supplied with the instrument. Pointer electrode have an insulating handle for adjustment of the spark gap. Low voltage input is via a pair of mounted 4 mm Sockets. Spark 25mm.

ESP59158

Induction Coil 500 Turns

Coil 500 Turns, Use to connect with connecting lead, Overall Dimensions : 64 x 53 x 40mm, Copper wire dia. 0.5mm coil on hard plastic base with 4mm socket, Plastic base is marked with coil turn direction and number of turns Can be mounted on U-core and I-core
Dimensions : 6.50cm (L) x 4.00cm (W) x 6.00cm (H)

ESP59159

Copper Wire Od 0.6 mm, 15 m

Copper Wire OD 0.6 mm, 15 m, Wire
Dimensions : 0.6mm length 15m, Wire spool: size 47 x 40 mm, Material: Enamelled copper wire ;Wire spool: Plastic, Wire wrapped around at spool

ESP59161

Primary And Secondary Coil

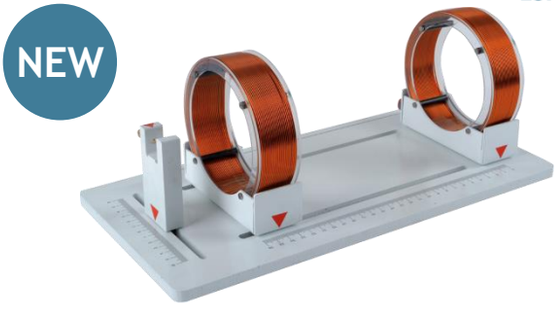
This primary-secondary coil is ideal for studying electricity and magnetism in the physics classroom. It is also an excellent demonstration induction coil that is remarkably easy to use. Consisting of two wire coils and one soft iron core, it features a primary (inner) coil heavy wire and a secondary (outer) coil of fine wire. Both coils
feature binding posts attached to sturdy plastic mountings which are non-metallic for maximum efficiency,Use requires battery, galvanometer, and switch. Grades 6-12.

ESP59156

Induction Coil (100 mm)

This is a device that uses a DC current as a power source and boosts the voltage induced by a contact-less oscillator to a high voltage by a high- voltage coil.
• The +, - polarity of the second high voltage can be changed and the frequency can be adjusted.
• Can be used as a power source for spectral tube, vacuum discharge tube creek tube, etc., and can prevent damage to pipes used as stable voltage discharge of DC. Type B: AC220V, DC12V, detector (discharge rod) included
Function: Frequency control, polarity switching, discharge distance Max. 100 mm ; Size 300*300*160mm 4.8Kg

ESP59157



Helmholtz coils

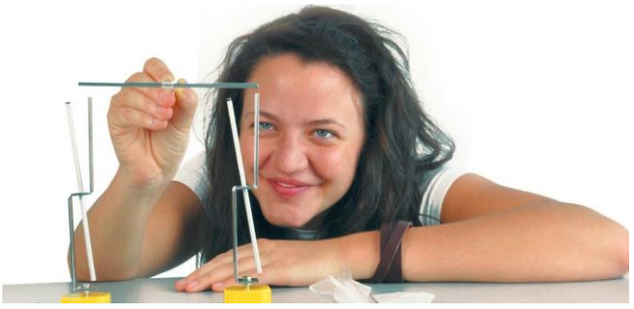
Consist of Two flat mobile coils NOf 100 copper turns (5layers of 20 turns) on steady metallic support graduated. Variable
gap of coils until 240 mm. Movable device for teslametric probe.
Max. intensity : 5A. ·Used for following experiments:
·Magnetic fields measures- Ampere's theorem-··Determination terrestrial magnetic fieldol

ESP59160

Helmholtz coils on Base

Helmholtz coils 400 turns of copper wire are mounted on former of about 150 mm diameter , 4 mm terminals , the max current in the coil is 1A to avoid overheating , min max distance coil can be a part 1.75" to 12" , direction of current marked on each coi

ESP59164



Student Electrostatic Kit

Kit consisting of:
2x Electroscope 1x
Acrylic bar 1x Plastics bar
1x Plastics bar, with drilling 1x
Polyethylene rubber pad 1x
Aluminium bar
1x Acrylic bar, with drilling 1x
Fluorescent lamp
2x Insulating block with socket 1x Plug
pin with needle
2x Aluminium-stripe 1x
Faraday beaker 1x Beaker
glass

Storage:

1x Box insert Electrostatics,
1x Storage box II, mini, with cover, Box -
insert plan with 2 labels

ESP59177

Junior High School

Senior High School

Electrostatics Kit
ESP59457

- Electrostatics kit is a set of tools which can be used to do experiment concerning the electrostatic. Electrostatic is produced by rubbing acetate cellulose or polietilen strip with existing wool. This kit is completed with electroscope to test the electric charges.

Advantages

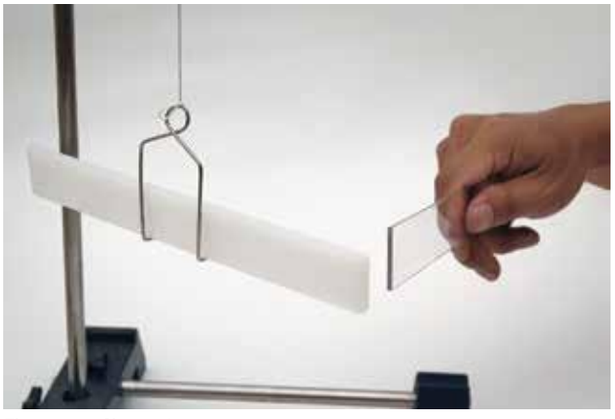
- Electroscope is using aluminium sheet. The frame is constructed with aluminium material which is mounted on isolated plastic, there are open-able glass windows. There also 4 mm socket for grounding. There is a 0 - 90 degree graduation.
- There are two detachable electrodes (electroscope head), in different shapes.
- Equipped with components which can be used for electric charges, electric charge interaction, electroscope, electrostatic induction, electrophorus, and many other experiments.

Component List

	Cat. code	Component	Description	Qty
a	FES 15/01	Electroscope	Size: 110 × 90 × 50 mm; Framework made of aluminum mounted on a plastic base; 4 mm socket for grounding; the scale of 0 – 90 × 10 ° to show the deflection of elektroskop leaves; glass windows can be opened; has two pcs electrodes in the shapes of disc andhook that can be changed.	1 Set
b	PES 325	Aluminium Cup	Size: Ø 30 × 55 mm, used to indicate the electrical charge which is located on the outer surface of the conductor.	2 pcs
c	PES 160	Politin Bar	Size: 200 × 30 mm, as producer of static electric charges, used in conjunction with woolen cloth.	2 pcs
d	PES 180	Cellulose Acetate Bar	Size: 200 × 30 mm, as producer of static electric charges, used in conjunction with woolen cloth.	2 pcs
e	PES 310	Switching Charge	Metal disc Ø 13 mm with insulated handle to retrieve or transfer of static electrical charges.	1 pc
f	PES 280	Polystyrene Balls, Metal Coat	Ø 19 mm, is used to demonstrate the interaction of electric charge and can be used as elektroskop "pith ball".	4 pcs
g	PES 200	Electrophorus	Disc-shaped Ø 45 mm with insulated handle; as a producer of continuous static electric charges; used with polyethylene board.	1 pc
h	PES 315	Stirrup	Used to hang the polyethylene blade or acetate cellulose; used together with nylon cord	1 pc
i	PES 300	Soft Nylon Cord	To hang polystyrene balls or stirrups	1 pc
j	PES 251	Aluminium Sheet	Used for electroscope leaf and the spare.	2 pcs
k	PES 160 01	Polytin Board	Size: 75 × 75 × 3 mm; used in conjunction with the electrophorus as the producer of continuous charges	2 pcs
l	PES 241 01	Wool Fabric	Size: 200 × 200 mm; used to rub the polyethylene blade and cellulose acetate to produce a static electric charges.	1 pc

Experiment Topics

- E1 Plastic Loading Bar
- E2 Electricity Charge Interactions
- E3 Electroscope
- E4 Electrostatic Induction
- E5 Electrophorus
- E6 Electroscope "Pith Ball"
- E7 Charge Distribution



Electricity Charge Interactions

Electrostatic Induction

Electroscope

Electrostatic Experiments Kit

This module enables experiments on electrostatics in combination with a Wimshurst machine or a Van de Graaff generator.

- robustly designed equipment,
- the equipment is stored in predefined places,
- in impact-resistant plastic casing, with lid,
- delivery includes experiment manual

Set consisting of:
1x Round base with stand tube 1x Insulating support
1x Paper bush
1x Needle on a plug 1x Pointed wheel 02 1x Flash-board
1x Set of chimes
1x Capacitor plates with cylinder 1x Sphere with metal surface
1x Grains for copier-principle
1x Connecting leads SE, 50 cm, black 1x Connecting leads SE, 75 cm, red 1x Pad of paper for copier-principle 1x Liquid glue

Storage:
1x Box insert electrostatics Demo, foam 1x Storage box II large, with cover
Experiments:
Spark discharge
Point discharge
Paper bush
Flash-board
Set of chimes
Bouncing ball
Principle of a copier
Electrostatic filter

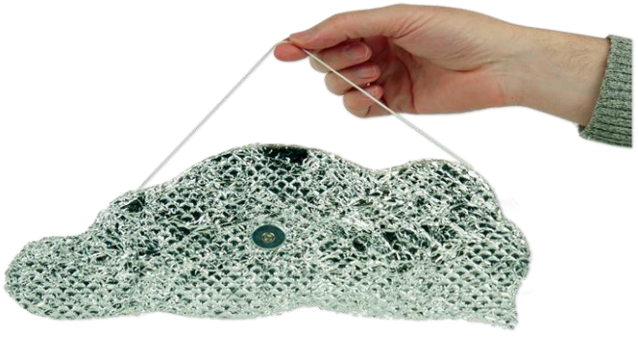
ESP59173

House With Lightning Conductor

To describe the effect and function of a lightning conductor on a house; model of a house with translucent front; fluorescent tube on the inside for indication of the charges and it's derivation; fluorescent tube on the outside with conductor-adapter for demonstrating the conduction of a lightning bolt; placed upright on isolated "meadow" with grounding plug socket.

Dimensions : 200 x 90 x 310 mm

ESP59174



Thundercloud

For demonstrating the discharge of a thundercloud on a house (with lightning conductors); large cloud-model; with 4-mm jack and carrying strap.

Dimensions : approx.. 320 x 150 mm

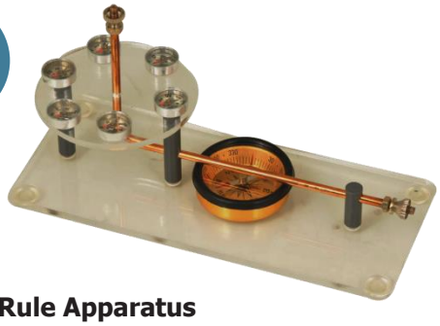
ESP59175

Laplace Law

To demonstrate the electromagnetism. A pair of powerful magnets in U shape holder. A pair of brass rail with 4mm socket is used for demonstration. A brass axle with two plastic discs is free to roll along the rails and complete the circuit between rails. As the axle placed on the rails near the poles of magnets and power supplied to the rails, the axle repelled and rolls away from the centre of magnetic field along the rails.

ESP59163

NEW



Ampere Rule Apparatus

Includes: (1) Apparatus, (1) 45mm compass, (6) 16mm compasses
This apparatus allows student to study the magnetic field around a wire. Heavy brass wire with terminals is arranged on a clear plastic base. Also included are 1 each 45 mm compass and 6 each 16 mm compasses. Dimensions 17.5 x 7.5 x 10 cm approximately

ESP59165

Paper Bush

For demonstrating how charges of the same polarity repel each other, bush consisting of strips of paper (L = 210 mm, B = 10 mm), mounted on a 4-mm plug

ESP59167

Line Of Streamers

For displaying an electrical field, a number of strips of paper (L = 200 mm, B = 10 mm) attached to a rubber band (L = 200 mm), clasp at the ends of the band, may be mounted on conducting sphere with a diamter of 200 - 300 mm

ESP59168

NEW

Faraday Cage

Metal mesh cage with a hook, used to shield objects from electrical fields
Diameter: 242 mm, height: 320 mm

ESP59188

High-Voltage Power Supply, 18 KV

Continuously variable high-voltage power supply for experiments in electrostatics. This instrument is easy to transport and can be mounted magnetically; the 20-mm LED display allows readings to be taken even from a distance.

TECHNICAL DATA :
Output: 0 ... + 18 kV, continuously variable, Max. 0.5 mA
Voltage indicator: 7-segment LED display, digit height:
20 mm Power supply: 4 x 1.5 V Mignon cells (included)
or
5.5-mm hollow DC jack for 6 V / 500 mA external power supply
P3120-6N The green ABS plastic case is labelled in yellow,
and 10 strong neodymium magnets are inset in the rear panel for mounting the device magnetically.

Recommended accessory :
Mains transformer 6V DC / 500
mA S-shaped assembly platform
Dimensions : approx. 160 x 120 x 45 mm
Weight : approx. 970 g

ESP59166

Insulating Mat

Rubber mat for insulating persons and apparatus from the ground;
Dimensions : 400 x 400 mm

ESP59169

Pointed Wheel 02

ESP59170

Electroscope student

For electrostatics experiments and for displaying potential;
Aluminium strip with a notch for balancing the robust pointer
(L = 140 mm) made from aluminium; mounted with very little friction;
height: approx. 160 mm

Insulating Block With Socket

To be used as “insulated” base, plastic block with 4-mm bush

ESP59171

Electroscope Digital Demo Unit

Demonstration meter for measuring high electrostatic voltages, unlike mechanical electroscopes, this instrument delivers exact and clear quantitative readings as well as the polarity of the charge, the value measured can be frozen using the hold switch, this instrument is easy to transport and can be mounted magnetically, the 26-mm LED display allows readings to be taken from a distance

TECHNICAL DATA :

Display: 2 1/2-digit LED display, digit height 26 mm
Measurement input provided by means of specially insulated 4-mm safety jacks
4-mm safety jack for ground
connection Measuring range: 0 ...
18.0 kV
Reset button for resetting instrument
to zero Accuracy: better than 2 % for 0
... 10 kV Throw switch: ON/OFF
Throw switch: measure sample - freeze measured value (hold)
Power supply: 4 x 1.5 V Mignon cells (included) or 5.5-mm hollow DC jack for 6 V/500 mA external power supply (not included)
Case: green ABS plastic with yellow
labelling **Dimensions :** approx.
160x120x45 mm, **Weight :** approx.
483g

ESP60262

Electroscope, Demo, with Carbon Pointer

For experiments on electrostatics, for displaying and measuring electrical charges and voltages, and for demonstrating influene;large and robust pointer made of carbon fibe, exceptionally well visible, very low-friction tip bearing,mounting bracket of robust sheet steel, with 4-mm special socket for laboratory or safety cable,large scale with 30 graduations (2° each) for quantitative reading of pointer deflection,large plastic base.

Pointer: D=5 mm, L=200 mm - Scale: 120x110 mm

Dimensions: 160x120x285 mm -Mass: approx. 271 g

ESP59181

Electroscope Pointer Type

With a pivoted aluminium pointer moving over the graduated scale. Eliminates problem of breaking of leaves and their re-fixing.

ESP59182

Gold Leaf Electroscope

In sheet metal case, with glass window and fitted with 4 mm earthing socket. A metal disc passes through an insulating polythene bush and ends in a flat support for gold leaf?.With a transparent graduated scale to show quantum of deflection. With a supply of leaves and instructions.

ESP59179

Pith Ball Electroscope

With the Pith Ball Electroscope, see pith balls be repulsed and attracted during your electrostatic study

ESP59185 Type 1
ESP59186 Type 2

Wimshurt Machine
ESP59205

Senior High School
Junior High School

Physics

Wimshurst machine is an electrostatic generator using electrostatic induction to multiply the electric charges continuously.

Wimshurst machine can produce ±300 kV static electricity.

Static electricity is produced by two disc which are rotating in contrary direction, each disc has metal sectors. Two quadrants have different electric charges and two other quadrants have identical electric charges.

A pair of Leyden jars, each has ± 140 or a total of 70 pF capacity, are used to store the produced static electric charges.

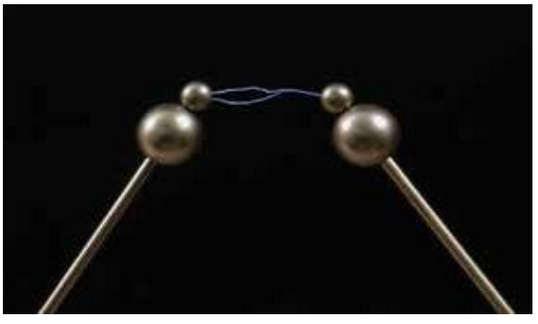
Advantages

- Transparent plexiglass material frame, allow exposing the apparatus mechanism.
- Discharging rod can be easily adjusted to change the charge quadrant.
- Run with hand, no electric power required. The crank shaft is supported by ball bearing for smoother rotation.
- Two pieces of electrodes in ball shape equipped with plastic handles to adjust the spark distance.
- There are 4 mm sockets which can be used to connect to other high voltage source if necessary

Weight	1,5 kgs

Specification

Disc	2 pcs plexiglass disc, Ø 300 mm with 28 sectors.
Electricity arc distance	100 mm (maximum)
Dimension	390 × 300 × 200 mm
Weight	1,5 kgs



Electrostatic arc

Electrostatic Cloth Rubber

Electrostatic cloth, used for generating static charges for the teaching and the demonstration of electrostatics. **Dimensions :** 250 mm square.

ESP59199	Silk (Viscose)
ESP59201	Woollen
ESP59203	Flannel

Electrostatic Rods

ELECTROSTATIC RODS, are used for generating static charges for the teaching and the demonstration of electrostatics. **Dimensions :** 30 0x 10 mm. (Length x Diameter)

ESP59189	Polythene
ESP59191	Nylon
ESP59193	Ebonite
ESP59195	Glass
ESP59197	Perspex

Physics

Van de Graaff Generator
ESP59210
ESP59212 & ESP59214

Senior High School
Junior High School

Van de Graaff generator is a static electric machine which produces very high DC voltage by collecting and storing electric charge on the hollowed spherical surface.

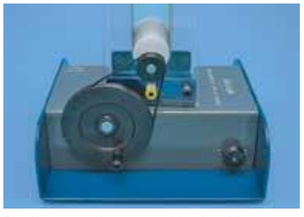
This apparatus can be operated in two ways. First is using a 220 volt AC electric motor which has speed adjuster. Second is directly run by hand. Changing the running method is easily done by displacing the rubber belt from the motor to hand pulley or vice versa.

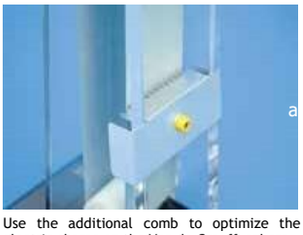
Advantages

- Hollowed spherical is made of stainless steel in 220 mm diameter.
  The upper part can be uninstalled to show the generator work mechanism.
- Hollow spherical capacitance ±12 pF as the electric charge collector.
- Static electric voltage can reach ±330 kV. Electric spark can reach 50 – 100 mm distance, depends on the environment humidity.
- On the lower brush there is 4 mm socket which can be used to connect to other high voltage source if necessary.

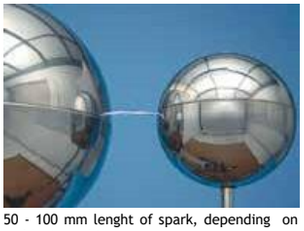
Specification

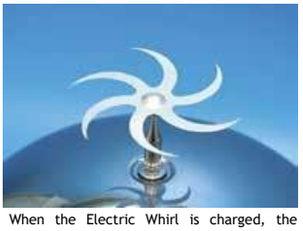
Charge collecting sphere diameter	: 220 mm
Spark gap length	: 50 – 100 mm (maximum)
Mains voltage to run motor	: 220V
Dimension	: 630 × 195 × 195 mm
Weight	: 5,3 kgs


Can be manually operated by hand by moving the driving belt position.



Use the additional comb to optimize the electric charge on the Van de Graaff sphere.


50 - 100 mm lenght of spark, depending on ambient conditions.

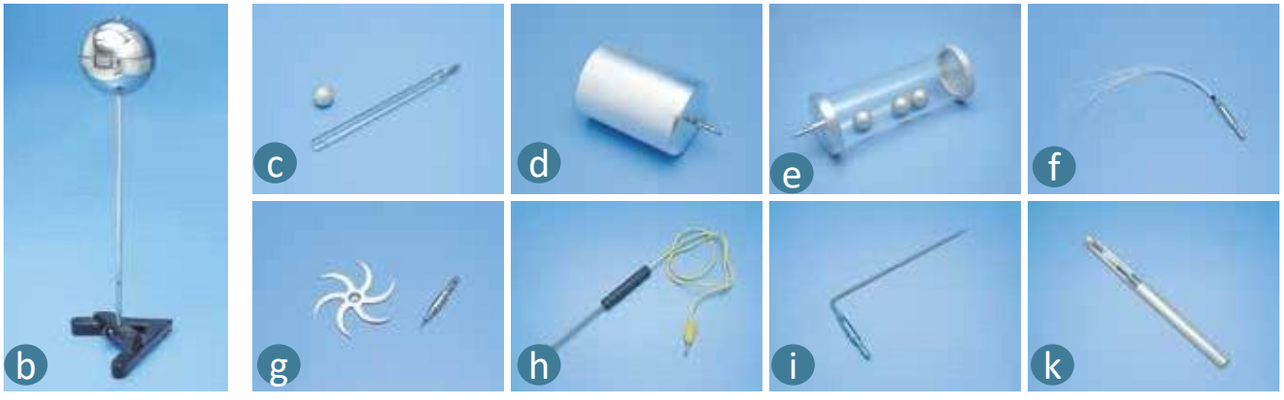

When the Electric Whirl is charged, the discharge repulsion at the point can make the wheel rotates freely on the axle.

Component List

All accessories are provided with plug 4 mm system, mounting on dome with 4 mm socket system.

	Cat. code	Component	Description	Qty
a	ESP59212	Van de Graaff Generator	Static electricity producing machines	1 pc
b	ESP 400.01	Conductor Sphere on Rod	Mounted on a 410 mm long, Ø10 mm rod with 4 mm safety terminal. The rod is mounted on a base.	1 Set
c	ESP 400.02	Perspex Pillar with Metalised Sphere	With suspended metalised sphere, Plexiglas material, Ø 10 × 150 mm. This unit can be plugged into the top of the Van de Graaff sphere as a simple "pith ball" electroscope.	1 pc
d	ESP 400.03	Faraday's Pail	Aluminum material, Ø 72 × 100 mm, complete with 4 mm banana plug.	1 pc
e	ESP 400.04	Metalised Spheres in Transparent Cylinder	Plexiglas material, Ø 56 × 150 mm with cap and bottom made of aluminum. Fitted with banana plug and 3 pieces of metalised spheres	1 pc

	Cat. code	Component	Description	Qty
f	ESP 400.05	Hair Mode	Several nylon cord, Ø 0,5 × 200 mm, bunched at one end on one end of a metal rod with a banana plug at the other end. When plugged into the hole of the charged Van de Graaff sphere, the "hairs" stand up in several direction	1 pc
g	ESP 400.06	Electric Whirl	Aluminum material, Ø 50 × 0,5 mm, completed with brass axle, Ø 2 × 60 mm, mounted on the plug.	1 pc
h	ESP 400.07	Discharge Ball	Nickel plated brass; mounted on a brass rod Ø 4 × 120 mm; nickel plated with insulated; complete with 500 mm length of lead with 4 mm banana plug.	1 pc
i	ESP 400.08	Discharge Pointer	Brass rod nickel platted Ø 3 mm × 150 mm, for deflecting or blow out a candle flame	1 pc
j	ESP 400.09	Additional Comb	The additional comb is made from aluminum, 92.9 x 39 x 17.7 mm. It is used to increase the electrical charge inside the Van de Graaff sphere.	1 pc
k	ESP 400.18	Neon Lamp 60 V	Mounted on plastic tube with aluminum holder, 13 cm in length	1 pc
l	ESP 400.10	Rubber Belt	Used as the reserve of main rubber belt. Made of special rubber material which can produce static electricity	1 pc



Experiment Topics

- E1 Standing Hairs Electric
- E2 Spark Flying Ball
- E3 Electric Wheel
- E4 Jumping Ball
- E5 Electric Charge
- E6 Detecting Flame of
- E7 Fire Direction is Bend
- E8 Neon Lamp is Glowing

Standing Hairs

Jumping Ball

ESP59210

ESP59214

ESP59212

Van De Graph Generator II

An electrostatic generator using the friction between the outer cylinder and the inner belt

- By rotating the belt, static electricity generated by friction with the outer cylinder is stored in the upper accumulation ball.
- Charged electricity is discharged when it is close to the charging ball on the earth side.
- Aspiration and repulsion of static electricity, human body charging, electric power lines,

It is used in experiments such as charging in air.

- You can adjust the power generation with speed control.
- Built-in speed controller, drying heater charge ball Ø 200mm, charge ball Ø 70mm

Power: AC220V60Hz 60W

Dimensions : 270x230x550mm

ESP59223

Van De Graff Generator With Accessories Irwin

The Irwin Van de Graff generator is designed to be operated by hand (which confirms that the charge generated is independent of mains electricity) or by mains electricity from an additional power source required. This rugged unit will help you give demonstrations that will impress the socks off your students, or at least stand their hair on end. It is ideal for performing all basic electrostatic experiments on a large and spectacular scale! With sparks of 8 cm to as high as 12 to 15 cm, yet a maximum continuous current of just 10 micro-amps, it's quite safe for classroom use. The unit requires minimal assembly when shipped and is supplied with an extra transport belt.

Features

Neon indicator and a helicopter. Rubber drive belt, Silicon main belt, Discharge sphere, Head of hair

Dimensions :

Sphere Diameter 280mm, Overall height 760mm, Base length 380mm, Base depth 230mm, Weight 8kg

ESP59208

NEW

Conductors Metal Spherical

Spherical Metal Conductor, Diameter 5cm,Used for exploring the charge distribution and charge holding capacity of the different shaped conductors and demonstrate the Gauss' Law relating to distribution of charge and dependence of field strength near a conductor on its radius of curvature. Comprises a hollow brass conductors of different shapes mounted on top of insulated pillar on a base.

The conductors are interchangeable on pillars.

ESP59227

NEW

Spare Charge Collecting Belt

This item is a charge collecting belt only and does not include the Van de Graff.

ESP59221

NEW

Lightning Conductor

ESP59231

Two Plates with Metallized Pith Ball Suspended Between

Useful for exploring the principle of working of capacitance and the relationship between charge, voltage and capacitance.

ESP59235

Hair Model For Van De Graff Generator

A complementary tool in the experiment s Van de Graff. Dimensions :Brass rod with plug : 4 x 50 mm Hairs : 0.3 x 200 mm Material : Brass and nylon Mounted on the plug Part of Van de Graff Generator, Set.(ESP59210)

Dimensions : (L) 12.00 x (W) 1.00 x (H) 1.00 cm

ESP59218

Additional Comb For Van De Graff Generator

Use for increase the electrical charge on spherical cavity of Van de Graff.

Dimentions : 92.9 x 39 x 17.7 mm Material : aluminium

Part of Van de Graff Generator, Set (ESP59210)

Dimensions : (L) 0.00 x (W) 0.00 x (H) 0.00 cm

ESP59220

Plasma Ball 8 inches

A large, 8" diameter Plasma ball that looks fantastic in a darkened room. The unit may be used for illustrating Ehv, capacitance effects, voltage breakdown of gases, differing energy states etc. Used with our technicians' friend tester you can demonstrate electric field strength. Our plasma ball is a miniature Tesla coil. Inside the ball is a coil of wires that have electrons going through them oscillating at a very high frequency. This shakes the atoms around the wires so hard that their electrons start to fall off! Inside the glass, the globe has a partial vacuum. This just means that some of the air has been sucked out. Because there is not as much air in there, it is easier to make electric sparks that can be seen.

The electrons then travel out into the air from the glass ball. We know this because the plasma ball lights up the light bulb. If you touch the plasma ball, all of the electrons will go through you to the ground. You see only one big spark inside the ball where you put your hand. If you stand on a stool, you are insulated from the ground and get filled with electrons. This means you can light up a fluorescent light bulb!

ESP59232

Plate Condenser (Aepinus Condenser)

Steel plate capacitor used to investigate the relationship between charge, voltage and capacitance, as well as determining the dielectric and electric field constants.

It consists of a fixed and a movable plate on a guide rail. A centimeter scale is used to read the plate spacing. The device comes with four dielectric sample plates made of acrylic, Bakelite, plywood and cardboard. Plate spacing: 0 to150 mm Plate diameter: approx. 149 mm Plate area: 175 cm - Connection: Via 4-mm safety jacks

ESP59234

Electric Field Apparatus

For visual demonstration of electric fields. A transparent plastic base supports a glass dish 90 mm diam. And two 4 mm socket terminals mounted on two insulated pillars with two wire point electrodes, two circular electrodes and two T-shaped electrodes.

ESP59237

Charging & Discharging Of Capacitor

Charging and discharging of a capacitor can be easily demonstrated by using this kit. A 10000F electrolytic capacitor mounted on a plastic moulded case (140x80x36) mm approx. with a provision for connecting current meter and voltmeter across the capacitor.For selection of charging / discharging, a toggle switch is provided on the base. For precisely measurement of current and voltage across the capacitor, a series resistance is fitted in the circuit to give a time constant of 50 second. Operating voltage for the instrument is 5V DC.

ESP59239

Electrode Plates

Plates for simple cell, Each plate fitted with a 4mm socket terminal.

ESP59241	Zinc	**ESP59243**	Copper
ESP59242	Carbon	**ESP59244**	Lead
ESP59245	Aluminum		

NEW

Carbon Electrode PK/50

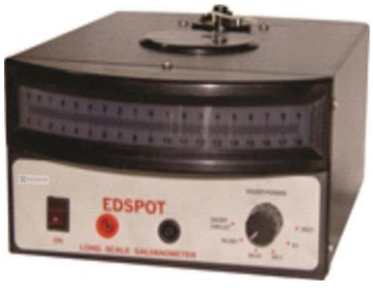
LED - Length 10 cm and dia. 5 mm Pack of 50.

ESP59247

Carbon Electrode Holder

Plastic Strip of size 78 x 27 x 5 mm fitted with two crocodile clips with 4 mm sockets.

ESP59248



Galvanometer Spot Reflecting

Suitable for Industrial Kelvin Double Bridge and Senior Kelvin Double Bridge. Galvanometer Resistance 125 ohms Nominal, Sensitivity 15mm scale division

per micro amp., Time period 2 second, critical damping resistance 1000 ohms and working voltage is 230 Volts. AC. 50 Hz.

ESP59249

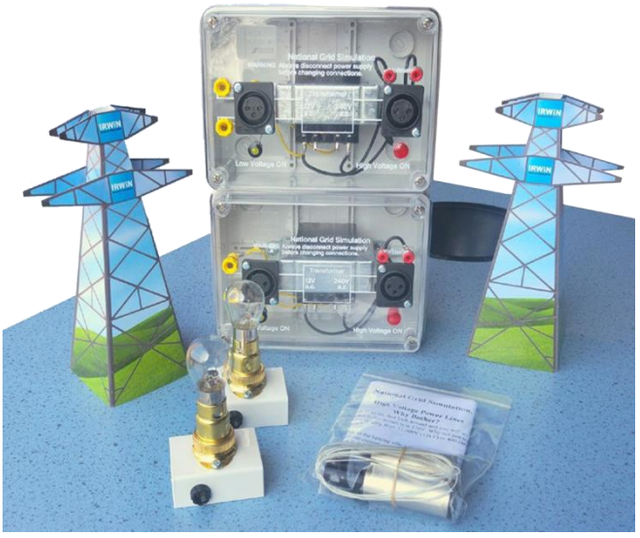
Capacitance Substitution Box

Our five-decade capacitance substitution box has been specifically designed for the schools market with its clear display and ease of use. Unit will simulate capacitances from 100pF to 9.9999?F in 100pF steps, Max. Voltage 50V DC, The required capacitance is set by a counter with the value displayed in µF, nF and pF, Output is via 4mm terminals with 4mm sockets, Housed in a sturdy ABS box

Technical Details

Voltage rating 50V DC max.
Capacitance range 100pF to 9.9999?F in 100pF
steps Accuracy 10% per decade
Residual capacitance 40pF

ESP59278



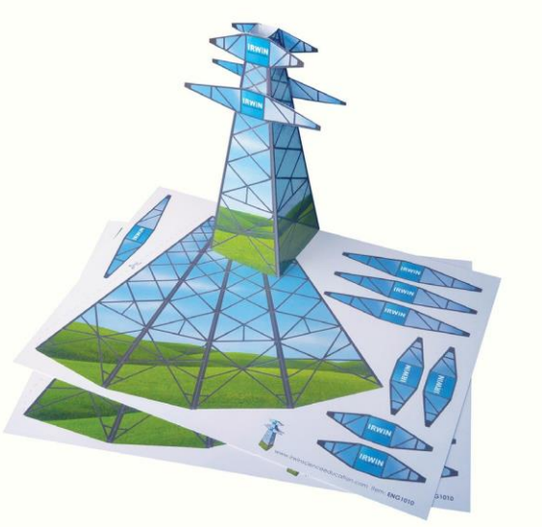
National Grid Kit

As this experiment is now featured in the Science curriculum as the 'AC power line at high voltage' we have developed a new, safe form of the experiment that can easily be set up within minutes and clearly shows students the relevant principles of the national grid high voltage transmission system.

Each Kit contains:

2 x Transmission/Receiver boxes (clear lid to enable students to investigate wiring)
2 x Lamp holders
2 x 12V 21 watt lamps
1 x Set of "HT" leads with touch-proof connectors
2 x Self-assembly fold-away pylons (display purposes
only) Experiment instructions included
Manufactured in the UK
*An additional Power supply is required to carry out this experiment capable of supplying 12V AC at 5A and 6 connection wires. Our full range of power supplies can be found here.

ESP59268



Pylons Kit

Our additional Pylons pack contains 5 thick card sheets which once cut-out produces 5 pylons to be used in conjunction with our National Grid Kit to give your pupils a clearer explanation on how the experiment works.

ESP59269

Capacitance Decade Box 10 - 100 pf

All accurate capacitors to serve as laboratory standard, very useful in resonance timing / wave shaping / oscillator experiments, ± 5% accuracy. Voltage range 63 V.10 - 100 pf in steps of 10 pf

ESP59277A

Capacitance Decade Box 10 - 100 kpf

All accurate capacitors to serve as laboratory standard, very useful in resonance timing / wave shaping / oscillator experiments, ± 5% accuracy. Voltage range 63 V.10 - 100 kpf in steps of 10 kpf"

ESP59277D

Capacitance Decade Box 100 - 1000 pf

All accurate capacitors to serve as laboratory standard, very useful in resonance timing / wave shaping / oscillator experiments, ± 5% accuracy. Voltage range 63 V.100 - 1000 pf in steps of 100 pf

ESP59277B

Capacitance Decade Box 0.1 - 1 µf

All accurate capacitors to serve as laboratory standard, very useful in resonance timing / wave shaping / oscillator experiments, ± 5% accuracy. Voltage range 63 V.0.1 - 1 µfd in steps of 0.1 µfd"

ESP59277E

Capacitance Decade Box 1 - 10 kpf

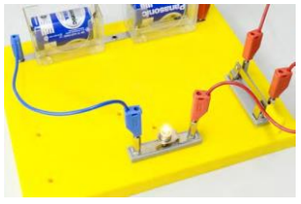
All accurate capacitors to serve as laboratory standard, very useful in resonance timing / wave shaping / oscillator experiments, ± 5% accuracy. Voltage range 63 V. 1 - 10 kpf in steps of 1 kp

ESP59277C

Capacitance Decade Box 1 - 10 µfd

All accurate capacitors to serve as laboratory standard, very useful in resonance timing / wave shaping / oscillator experiments, ± 5% accuracy. Voltage range 63 V. 1 - 10 µfd in steps of 1 µfd

ESP59277F



Electricity Simple Kit 2 ,(Set Of 1)

High quality kit, designed for teaching simple electric circuits in Primary Schools. The students will be able to acquire basic knowledge on electricity and the principle of electric power generation. They will also be able to perform experiments with their own ideas.

Experiment
topics:

Simple electric
circuit. Parallel
circuit.

Series circuit.

Electric conductors and non-
conductors. Application of electric
energy.

Generation of electric energy by a
dynamo. Specification:

The kit contains 1 assembly board complete, 1 Switch complete, 2 lamp sockets, 2 Bulbs E 10 2.5V, 2 battery holders Complete (without battery), 3 Cable with Sticker Red, 3 Cable with Sticker Blue, 1 Conductor Holder Complete, 1 Copper-Conductor #1x15x81mm, 1 Aluminum Conductor #1 x 15 x 81 mm, 1 Steel Conductor #1 x 15 x 81mm, 1 Plastic Non

Conductor #1 x 15 x 81mm, 1 Wood Non Conductor, 1 Motor complete,

1 wheel complete, 1 wheel Axle Extension, 1 Belt and 1 Nylon Rope 1500mm (L) (no. 12)

Dimensions : (L) 25.00 x (W) 20.00 x (H) 4.50cm
Weight : 0.600kg

ESP59258

Electricity Simple Kit 2 ,(Set Of 10)

High quality kit, designed for teaching simple electric circuits in Primary Schools. The students will be able to acquire basic knowledge on electricity and the principle of electric power generation.

They will also be able to perform experiments with their own ideas.

Consist of :

1 Assembly Board Complete 10 pcs, 2 Switch Complete 10 pcs, 3 Lamp

Socket 20 pcs, 4 Bulb E 10 2.5V 20 pcs, 5 Battery Holder Complete without Battery 20 pcs, 6 Cable with Sticker, Red 30 pcs, 7 Cable with Sticker, Blue 30 pcs, 8 Conductor Holder Complete 10 pcs, 9 Copper-Conductor # 1 x

15 x 81 mm 10 pcs, 10 Aluminium-Conductor # 1 x 15 x 81 mm 10 pcs, 11

Steel-Conductor # 1 x 15 x 81 mm 10 pcs, 12 Plastic Non Conductor # 1 x

15 x 81 mm 10 pcs, 13 Wood Non Conductor 10 pcs, 14 Motor Complete

10 pcs

15 Wheel Complete 10 pcs, 16 Wheel Axle Extension 10 pcs, 17 Belt 10

pcs, 18 Nylon Rope Length 1500 mm (No.12) 10 pcs, 19 Section Box 100

mm 1 pc, 0 Section Box 40 mm 1 pc, 21 Box Corrugated Plastic 420 x 270 x 207 mm, (# 3 mm, Yellow color) 1 pc

Experiment topics :

.Simple electric circuit, Parallel circuit, Series circuit, Electric conductors and non-conductors, Application of electric energy, Generation of electric energy by a dynamo,

Dimensions : (L) 43.00 x (W) 29.00 x (H) 21.00 cm
Weight : 9.316 kg

ESP59259

Resistance Board

inexpensive equipment suitable for student exploration of resistance, length, and cross-sectional area, also serving as a bridge or potentiometer, is available. The 40cm Resistance Board facilitates quantitative investigation of resistance for students. Equipped with 4mm terminals linked by a segment of resistance wire against a scale and a 'jockey', the board enables experimentation. Samples of wire provided include diameters of 0.30mm, 0.44mm, and 0.54mm, facilitating experiments exploring the correlation between resistance and cross-sectional area..

Press Key Switch (Contact Key)

contact key with press knob comprising of plates spring arm with press knob contact stud , plated connecting strip and 2 X 4 mm sockets terminals all mounted on moulded base

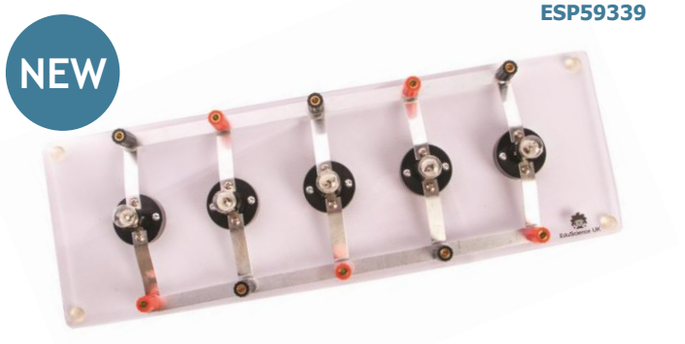
Dimn : 100 X 63 X 35 mm

ESP59284

Knife Switch Double throw

Bakelite knife switches Double with easy-to-use 4mm sockets.

ESP59339



Five Lamps in and Series circuit

Five Lamps in Parallel and Series circuit demonstration is a versatile piece of equipment that can help student figure out the difference between parallel and series circuits , include heavy duty base with 5 bulbs , 8 removable metal bars , and 10 thumb screws , base size : 5"X15", Power supply is needed to energies demonstration

ESP59265

Key/Switch One Way

copper plug key switch includes two, 4mm terminals, and one removable plug (with plastic guard). Fitted on a sturdy base. Useful in classroom physics experiments, and provides an interesting way to complete a circuit in electrical demonstrations.B ase measures 3"" wide and 2"" long. Copper blocks are approximately 0.6"" tall. Entire unit stands 1.75"" tall. Plug measures 0.75"" wide, 0.25"" long and 1"" tall.

ESP59331

Key/Switch Tow way

ESP59331

Key/Switch Three way

ESP59331

Resistor 1 K Ohm, 0.5W

Resistor 1 kOhm, 0.5W, Tolerance: 5%

Component mounted in plastic housing with 4mm plug which protrude downward, Electronic symbol is printed on top cover, used with Assembly board 120 holes and Assembly board 216 holes, Part of Circuit Application Trainer, basic Electricity Trainer and Power Electronic Trainer

ESP59511

Knife Switch Single throw

Knife Switch Single Throw with 2 X 5 mm connoting Sockets

ESP59337

Knife Switch Single Pole Double Throw switch

one Bade with 4 mm sockets .

ESP59338

Lamp Holder with 2 x 4 mm Sockets

Lamp holder : Double contact brass bulb holder mounted on rectangular moulded base ,with two 4mm socket terminals, holder for different range of mini bulbs.

ESP59263

Decade Resistance Box

This decade resistance substitution box provides 4 decade ranges as given below and total value 0 to 11110 Ohms with a resolution of 1 Ohm. Each decade is selected using rotary switch. All resistance values are of±1% tolerance and 2 watts maximum ratings.

ESP59282

Resistance Unit

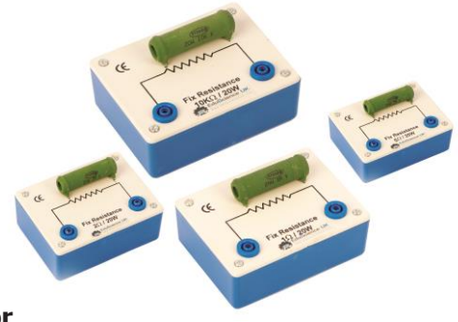
resistance units on a high stability metal film element. Improved and less expensive resistance coil. Accuracy ±1%.

ESP59285	1 OHM	**ESP59288**	20 OHM
ESP59286	5 OHM	**ESP59289**	50 OHM
ESP59287	10 OHM	**ESP59290**	100 OHM

Resistance Substitution Box

A 6 decade resistance substitution box ideally suited to school or college use. The box will simulate resistances from 1 ohm to 999,999 ohms in 1 ohm steps.

ESP59280



Resistor

Supplied in ABS box of size 95 x 70 x 30 mm, fitted with 4 mm sockets

ESP59294	Resistor 1	Ohms	20W
ESP59295	Resistor 2	Ohms	20W
ESP59296	Resistor 5	Ohms	20W
ESP59297	Resistor 10	Ohms	20W
ESP59298	Resistor 100	Ohms	20W
ESP59299	Resistor 1K	Ohms	20W
ESP59300	Resistor 10K	Ohms	20W

Rheostats, Protected

Rheostats, protected, Single tube, for use with high voltage upto 220V, fitted with 4mm socket terminals, with protected cover.

ESP59303	3 OHM, 12Amp
ESP59304	10 OHM, 8Amp
ESP59305	33 OHM,4.4Amp
ESP59306	100 OHM, 2.5Amp
ESP59307	330 OHM, 1.4Amp
ESP59308	1000 OHM, 0.8Amp

Rheostats

Rheostat is wound with heavily oxidised constantan wire on a vitreous enameled steel tube. The tube is supported on robust die cast end stands and the heavy duty sliding contact is of phosphor bronze, nickel plated for corrosion resistance, 4 mm terminal post are fitted facilitating external connection conventional 4 mm plug. Resistance 8.5 Ohms, Max. Current 5 Amp.

ESP59309	RHEOSTATS, Economy Open Type 8.5 OHM, 5 Amp
ESP59310	RHEOSTATS, Economy Open Type 16 OHM, 4Amp
ESP59311	RHEOSTATS, Economy Open Type 33 OHM,
ESP59312	RHEOSTATS, Economy Open Type 55 OHM, 0.3 Amp
ESP59313	RHEOSTATS, Economy Open Type 135 OHM, 1.4Amp
ESP59315	RHEOSTATS, Economy Open Type 300 OHM, 0.9 Amp

Potentiometer Wire

A one meter long resistance wire passes over a meter scale and is firmly clamped to stout brass end-plates, on wooden base. Complete with Knife-edge Jockey. Single wire

ESP59317 Single

ESP59318 Double

Wheatstone Bridge

- Measuring device using bridge circuit.
- Built-in multi stage resistors allow proportional measurement of unknown resistance.
- If the proportion between the built-in resistor and the measuring resistor does not match, the galvanometer current will move to the + or - side.

Devices made using this principle

Configuration : Includes resistance for measurement

Measuring range : 1-11110Ωm.

Dimensions : 330x160x120mm

ESP59325

Wheatstone Bridge, One Meter

This substantial bridge had broad, heavily plated brass strips mounted on polished hardwood base. Terminals with 4mm sockets are provided. 24 SWG

Constantine wire is stretched along the top of a meter scale in mm and cm. Complete with Jockey.

ESP59321	Wheatstone Bridge, One Meter-2	Two Gap
ESP59322	Wheatstone Bridge, One Meter-4	Four Gap
ESP59323	Jockey	For Wheatstone bridge and potentiometer work, with moulded ribbed insulating handle, plated-brass contact with locating notch, and a plated-brass terminal with a 4mm socket. **Dimensions :** 95 x 15mm diameter.

Joule & Watt Meter

capable of making direct measurement of electrical energy or power supplied to a load and is therefore a valuable tool for pupil based work as well as simplifying many demonstrations (IPC-1952-M). The direct readings mean that the need for voltmeter, ammeter, stop watches and calculators is eliminated and fast and accurate results can be obtained. The science understanding can therefore be gained from scientific investigations rather than mathematical manipulation, making it ideal for pupil based investigations at GCSE, Standard Grade level and A-level in science and technology courses. Its many uses include experiments with an electrical heater, determination of energy stored in a capacitor, calculating the power supplied by a d.c. source to a resistive load and measurement of the specific latent heat of steam.

The meter is capable of measuring energies from 1mJ to 9999J or power from 1mW to 200W in a.c. or d.c. circuits. Two ranges selected by a switch labelled mJ/mW and J/W are available. The auto-ranging four digit display will give direct readings of energy or power. The maximum current input is 10A. All electrical connections are via 4mm sockets.

Electrical Supply : 220-240VAC, 50-60Hz -Dimensions : 179 x 190 x 85mm overall -Mass : 1.6kg

Max. input voltage : 20VDC, 14VAC (rms) -Input resistance : 2MΩ (No load

Max. load currents : J/W range = 10A, mJ/mW range = 10mA - Max. energies : J range = 9999J, mJ range = 9999mJ

Max. powers : W range = 200W, mW range = 200mW - Accuracy : Typically ±5% of full scale reading

ESP59402

Joule Meter

Mounted upon wooden base fitted on stand A meter for measuring the power consumption of any mains operated appliance. Rotating disc and digital readout in Kwh,, 240 Volts,13 Amp.

ESP59408

Joulemeter, Student Digital

The ES Student Joulemeter is designed specifically for student use. The unit can measure energy from 1 joule to 999,999 joules, with accuracy of 3%, but 1% accuracy is typical. Power is by means of a 9V DC mains adaptor included

ESP59412

Digital Ammeter 10 Amps AC

Digital Ammeter 10 Amps AC

A digital ammeter able to measure to 10.00A a.c. with a resolution of 0.01A (IPC-1269-M). The 3½ digit liquid crystal display has 13mm high digits with a wide field of view unobscured by trailing leads. The display also provides indication of polarity and low battery. The unit is exceptionally easy to read. Two colour coded 4mm sockets are located on the sides for maximum convenience and anti-slip feet are fitted to the base. Low operating current gives expected battery life in excess of 500 hours. Housed in a robust ABS case. Supplied with battery.

Electrical Supply : 9V

Battery, type: PP3

Dimensions : 130 x 60 x 90mm overall

Mass : 0.18kg

Range : 0 to 10.00A

Resolution : 0.01A (10mA)

Input Resistance : 0.01Ω

Overload : 1 x full scale

Accuracy : ±1 digit, ±0.1% of full scale

ESP59427

Digital Milliammeter 200mA D.C. 0.1mA

A digital milliammeter able to measure to 199.9mA D.C. with a resolution of 0.1mA (IPC-1001-M). The 3½ digit liquid crystal display has 13mm high digits with a wide field of view unobscured by trailing leads. The display also provides indication of polarity and low battery. The unit is exceptionally easy to read. Two colour coded 4mm sockets are located on the sides for maximum convenience and anti-slip feet are fitted to the base. The meter is protected from current overload by an automatically resettable fuse. Low operating current gives expected battery life in excess of 500 hours. Housed in a robust ABS case. Supplied with battery.

Electrical Supply : 9V

Battery, type: PP3

Dimensions : 130 x 60 x 90mm overall

Mass : 0.18kg

Range : 0 to 199.9mA

Resolution : 0.1mA

Input Resistance : 1Ω

Overload : 1 x full scale (protected by automatically resetting fuse)

Accuracy : ±1 digit, ±0.1% of full scale

ESP59421

Digital Ammeter DC (0~1999mA)

An electronic Ammeter for measuring current , general accuracy is 0.5% 7 segment LED display Overload protection Safety socket connection Suitable for school experiment

ESP59426

Multimeter Digital True RMS Bench Top

80000 count True RMS Bench Digital Multimeter

- Large LCD, 80000 count Dual-display, Analogue bar 21 sets.
- 50 measuring functions, with basic DCV, ACV, DCA, ACA, - , CAP, Hz, etc.
- 18 types of frequency, frequency up to 8MHz, 1800 waveform
- Auto data update and refresh, auto data hold, auto peak hold.
- 36-hour dynamic record: MAG, MIN, AVG, MAX-MIN (REL-), (REL%),
- AC measuring adopts highly accurate true RMS measurement, measuring of any waveforms in AC range , -RS-232 interface DCV : - Range: 80mV/800mV/8V/80V/800V/1000V - Accuracy:- (0.05% 5) ACV : - Range:80mV/800mV/8V/80V/750V - Accuracy:- (0.8% 50) DCA : - Range:80mA/800mA/8A/20A - Accuracy:- (0.2% 10) ACA : - Range:80mA/800mA/8A/20A - Accuracy:- (0.8% 20) Resistance: - Range:800- /8k- /80k- /800k- /8M- /80M - Accuracy:- (0.3% 5) Frequency: - Range: 0.5Hz~8MHz - Accuracy:- (0.03% 2) Capacitance: - Range:1nF/10nF/100nF/1uF/10uF/100uF - Accuracy:- (2.5% 50) Temperature: - Range:-50- ~1372- / -58- ~2502 - Accuracy:- (2.0% 2) Square Wave Output: - Range:3V / 0.5Hz~5kHz / 1%~99% - Accuracy:- 0.02% Special Function : - Diode test - True RMS - AC DC measuring - Continuity alarm - Overloading protection - Input Impedance 10M- Sampling rate : 4times/s; Analog bar40 times/s , AC frequency response: 40Hz-50kHz Range selection : Auto range , Max. display : 80000 Accessories : Test lead, Power cord, User manual, Software CD, Temperature probe Power source : AC110V/220V, 50Hz/60Hz , Meter

Dimensions : 245x220x98mm

Net Weight : 1.5kg

ESP59376

DIGITAL MULTIMETER

Function	3 1/2 Manual Range Digital Multimeter ES835 	3 1/2 Auto Range Digital Multimeter ES833 	3 5/6 Auto Range Digital Multimeter ES837 	3 5/6 Auto Range Digital Multimeter ES86 
DCV	200mV/2V/20V/200V/600V	200mV/2V/20V/200V/600V	600mV/6V/60V/600V	200mV/2V/20V/200V/1000V
ACV	200V/600V	2V/20V/200V/600V	600mV/6V/60V/600V	200mV/2V/20V/200V/750V
DCA	20uA/2mA/200mA/10A	200uA/2000uA/20mA/200mA/2A/10A	600uA/ 6000uA/ 60mA/ 600mA/ 6A/ 10A	200uA/2000uA/20mA/200mA/2A/20A
ACA	-	200uA/2000uA/20mA/200mA/2A/10A	600uA/ 6000uA/ 60mA/ 600mA/ 6A/ 10A	200uA/2000uA/20mA/200mA/2A/20A
Resistance	200Ω/2kΩ/20kΩ/2MΩ/200MΩ	200Ω/2kΩ/20kΩ/200kΩ/2MΩ/20MΩ	600Ω/ 6kΩ/ 60kΩ/ 600kΩ/ 6MΩ/ 60MΩ	200Ω/2kΩ/20kΩ/200kΩ/2MΩ/20MΩ
Capacitance	-	-	60nF/ 600nF/ 6uF/ 60uF/ 600uF/ 6mF/ 60mF	-
Frequency	-	-	10Hz/ 100Hz/ 1kHz/ 10kHz/ 100kHz/ 1MHz/ 10MHz	-
	-	(-40~1000)℃/ (0~1832) ℉	(-40~1000)℃/ (0~1832) ℉	(-40~1000)℃/ (0~1832) ℉
NCV	√	√	√	√
	-	√	√	-
Backlight display	√	√	√	√
	-	√	√	-
Diode test	0V~2V, it displays “OL” if over 2V	0V~2V, it displays “OL” if over 2V	0V~3.3V, it displays “OL” if over 3.3V	√
	0~2000	0~2000	-	-
Duty cycle	-	-	1%~99%	1%~99%
	Less than 50Ω, it displays “OL” if over 200Ω	Less than 50Ω, it displays “OL” if over 200Ω	Less than 50Ω, it displays “OL” if over 610Ω	Less than 50Ω, it displays “OL” if over 200Ω
Low battery indication	Approx. less than 2.4 V	Approx. less than 2.4 V	Approx. less than 2.4 V	Approx. less than 2.4 V
	√	√	√	√
Function protection	√	√	√	√
	About 15 minutes	About 15 minutes	About 15 minutes	About 15 minutes
Input impedance	10MΩ	> 44MΩ	> 44MΩ	10MΩ
	3 times/s	3 times/s	3 times/s	3 times/s
AC frequency response	40Hz-400Hz	40Hz-2kHz	40Hz-2kHz	40Hz-400Hz
	Manual range	Auto range	Auto or manual range	Auto range
Max.display	2000	2000	6000	1999
	61x28mm	61x28mm	61x28mm	54x30mm
Battery	3V AAA×2	3V AAA×2	3V AAA×2	2x 1.5V AAA
	Quiescent current about 2mA	Quiescent current about 2mA	Quiescent current about 2mA	Quiescent current about 2mA
SKU No	ESP59380	ESP59379	ESP59381	ESP59377

Multimeter Analogue 20

Multimeter for measuring voltage and current, DC and AC, can also be used as a galvanometer.
As an ideal student Multimeter, it has two double scales.
All of this makes this device unique:
Electronic overload protection in all measuring ranges, with control LED display (no more fuses!)
Large, robust design with holster &robust selector switch
Good readability thanks to the inclined position
Transparent base with recessed grip for holding with one hand
1 mV final value range for measuring thermal and induction voltages without a preamplifier
All measuring ranges (including low currents!) are available in AC
Unusually good frequency behavior: typically -1.5 db at 20 kHz, which means that measurements on all types of resonant circuits are also possible
Large, easy-to-read mirror scale with clear printing
Extremely accurate, typically 1.5%
10 A range with its own input socket
Zero point center can be selected by switch position
Voltage ranges AC and DC: 1, 100, 300 mV, 1, 3, 10, 30 V
Current ranges AC and DC: 100 µA, 10, 30, 100, 300 mA, 1, 10 A
Internal resistance: 100 kOhm/V
Scale arc length: approx 90 mm
Power supply: 4 x 1.5 V Mignon batteries (Not included)
Dimensions: approx. 200x140x100 mm
Dimensions: approx. 675

ESP60251

Universal Multimeter Demo II

Durable servo-controlled measuring instrument to measure current and voltage with high precision; can be used in any position, for example vertically or horizontally for projection.
The large scale with an arc length of approx. 200 mm, the wide signal-coloured pointer and the 26 mm high digits guarantee a hassle-free reading of the measured values even from greater distances.
The LED display indicates the unit of measurement and current type and is also clearly visible from the distance. An internal electronic overload protection eliminates the annoying and time-consuming change of fuses. The meter can also be used as a sensitive galvanometer (measuring range 1 mV-) thanks to the built-in amplifier. Pointer setting: Zero at left or at midpoint
Four insert-able double scales: 1/3 - 10/30 - 100/300 - -5 to +5/-15 to +15 (included) Measuring ranges:
DC voltage: 1 mV, 1 to 30 V
AC voltage: 1 to 30 V
DC and AC amperage: 100 µA to 10 A
Rear panel with neodymium magnets for a stable magnetic mounting; Battery compartment for easy replacement of batteries.
Technical data :
Type of instrument : Moving-coil instrument Internal resistance : R = 100 kOhm / V
Working position : vertically or horizontally Measuring inputs : 4 mm safety socket
Fuses: internal electronic overload protection Power supply : four 1.5 V batteries (included) or 2.5 mm hollow DC jack for 6 V external power supply Housing : ABS plastics
Dimensions : 268 x 92 x 226 mm

ESP60249

Scales For Multimeter Demo Ii, Transparent, Set Of 8

Transparent inserting-scales; acrylic;
for universal multimeter demo II ESP60249
Ranges: 0-1, 0-3, 0-10, 0-30, 0-100, 0-300, -5 to +5, -15 to +15

ESP60250

Demonstration Meter II

Housed in a ABS plastic case 300 x 150 x 300 mm with glass front and rear. Moving coil type with accuracy of ± 2.5%. Basic sensitivity of meter is 5 mA, 100 mV f.s.d. The meter can be used to demonstrate the working principle of AC or DC ammeters or voltmeters with the interchangeable plastic scales,it is supplied with extended range box which allows one case to be used for different ranges.

ESP59382

Demonstration Meter III

Housed in a ABS plastic case 300 x 150 x 300 mm with glass front and rear. Moving coil type with accuracy of ± 2.5%. Basic sensitivity of meter is 5 mA, 100 mV f.s.d. The meter can be used to demonstrate the working principle of AC or DC ammeters or voltmeters with the interchangeable plastic scales. DIFFERENT DIALS ARE AVAILABLE AS PER CAT. NO.

ESP59383

Demonstration Meter Scale

A to be used with demonstration meter

ESP59383

ESP59384	0 – 300 V AC VOLTAGE
ESP59385	0 – 15 V AC Voltage
ESP59386	: 5 -0- 5 V DC Voltage
ESP59387	1 – 15 V DC Voltage
ESP59388	: 0 – 1 V DC Voltage
ESP59389	: 2.5 -0 – 2.5 MA DC Current
ESP59390	0 -10MA DC Current
ESP59391	0 – 10 MA AC Current
ESP59392	0 – 100 MA DC Current
ESP59393	0 -1A DC Current
ESP59394	0 – 1 A AC Current
ESP59395	0 – 10A DC Current
ESP59396	0 -10A AC Current

LCR Meter

Features :

32-bit core processor
5-digit 4.3-inch TFT LCD display
2 signal source output impedance: 30 Ω, 100
Ω 100 sets memories for internal
storage/save
500 memories for U disk storage/save, supports FAT16 and FAT32 files Save the last parameter settings before power off
Standard interface: RS-232, HANDLER, USB HOST
Optional interface: USB DEVICE, GPIB, headset, FOOT.C foot switch
Specifications:
Test parameter: | Z|, |Y|, C, L, X, B, R, G, D, Q,
Test Signal Frequency:
100Hz,120Hz,1kHz,10kHz Basic Accuracy:
0.15%
Equivalent circuit: Series, Parallel
Mathematical function:Deviation and Percent
Deviation Range mode:Auto, Hold, Manual Selection
Trigger mode:Internal, Manual, External, BUS
Measurement speed: Fast: max.30, Medium: 10, Slow: 3 (times/second) ((?1kHz))
Average times: 1-255
Delay time: 0-60s, step 1ms
Calibration function: Open circuit, Short circuit,
Load Measurement terminal: 5 terminal
Display mode: Direct, , %, V/I (monitoring tested voltage and current) Display: 5 digit 4.3-in LCD display

LCR Meter Hand Held

Measurement function
Test parameter : Main parameters: L / C / R / Z, Secondary parameters: X / D / Q /θ / ESR
Test signal frequency : 100Hz, 120Hz, 1kHz, 10kHz, 40kHz, 100kHz
Basic accuracy : 0.20%
Electrolytic capacitor measurement : Provided
DCR measurement : 0 to 20MΩ
Equivalent circuit : Series, Parallel
Ranging mode : Auto, Manual
Measurement speed :
Slow: 1 time/sec;
Medium: 2times/sec;
Fast: 4times/sec
Internal DC offset : 0-500mV adjustable, step 1mV
Test level : 0.1V, 0.3V, 0.6V, 1V
Clear function : Open circuit, Short circuit
Comparator function : Comparator limit range 1% to 50% adjustable; Fixed points 1%, 5%, 10%, 20%
Output impedance : 100Ω
Deviation function : Compare and display the deviation percentage between the component and the set nominal value.
Measurement display range : L 0.001μH - 2000H -C 0..01pF – 20.00mF
R 0.0001Ω – 20.00MΩ
General Operating environment : 0˚C - 40˚C, ≤80%RH
Power source : Lithium battery
Accessories : Kelvin test leads x1 set, Mini USB cable x1pc, power adapter x1pc, short connection plate x1pc, Banana-crocodile test leads x1 set, Software CD x1pc, Operation manual x1pc
Dimensions :90W*188H*33D mm

ESP59404

Measurement Signal:

Output impedance: 30 Ω, 100 Ω
Test level: 0.1V, 0.3V,
1V Test level accuracy:
5%

Measurement display range:

|Z|, R, X:0.01 M Ω – 99.999 M Ω
|Y|, G, B: 0.0001μS – 99.999
μS C:0.0001 pF – 9.9999 F
L:0.0001 H – 999.99 H
D:0.0001 – 9.9999
Q:0.0001 – 9999.9
(DEG):-179.99 -179.99
(RAD):-3.14159 – 3.14159
%:-999.99% – 999.99%

Comparator and interface

Memory: 100 sets memories for internal parameter settings storage/ save; 500 sets for U disk parameter settings storage/save
Standard interface: Standard: RS232, USB
HOST Optional interface: USB device, GPIB

Gneral:

Operating environment:0˚C – 40˚C, 80%RH
Power source: 110/220V≈10%, 47~63Hz
Power consumption: ≈ 30VA
Accessories: 4-terminal Kelvin test clip leads, RS232 cable, power cord, operation manual
Dimensions : 265W*100H*340D mm
Weight : Approx.3.5kg

ESP59405

Portable Applicant Tester & Checker

(Portable Appliance Tester and Checker). Performs electrical safety tests on portable appliances allowing compliance with EAWA regulations. The unit performs earth bond and insulation tests on both Class 1 and Class 2 appliances, extension leads, IEC and kettle leads etc. The unit is very simple to operate and gives clear, unambiguous pass/fail indications. Complete with test leads, instructions, pass and fail labels, a Tester's Certificate of Inspection and is fitted with moulded mains plug.

A simple to use PAT machine that allows the user to perform Class1 and Class 2 insulation tests, earth bond tests at two different current levels and extension lead tests. The compact unit clearly displays the results via coloured LEDs. A single push button initiates all the tests in a 5-second cycle.

Class 1 Earth Bond test -Class 1 and Class 2 Electrical Insulation test Mains switch and circuitry test -Extension Lead test IEC lead test -Results are displayed by coloured LEDs. Timed test period. -Comes complete with 100 pass labels, 50 fail labels, Earth Bond Test lead, Extension lead test lead and full instructions including sample inspection certificate.

ESP59407

ESP59409

ESP59410

ESP59411

Power Meter D.C. IRWIN

The Irwin Power Meter D.C. uses a large backlit display which displays four important parameters.

1. The Voltage across the load (V)
2. The Current flowing through the load (A)
3. The Power dissipated by the load (W)
4. The Amount of energy converted by the load (Wh)

The Power-meter is designed to be used with a low voltage power pack and can accept input voltages in Different ranges, The load (which may draw up to 20A) is connected to the load terminal. The display unit has a multi-purpose push switch which allows the backlight to be switched on or off (the unit remembers the settings when disconnected) and allows the energy reading to be reset.

The unit displays energy in Wh rather than Joules because a Joule display would quickly overflow. This can be used as a teaching aid (1Wh=3,600J) as well as allowing the pupil to time their power usage and calculate the energy converted in Joules. They can then compare their result with the Power-meter. Manufactured in the UK

ESP59409 Range 6.5-100V DC **ESP59410** Range 80-260V AC **ESP59411** TWIN - range 6.5-100V DC

Galvanometer Moving Coil ±300µA

DC current measuring instrument on a small scale easy to read

Dimensions : Overall 138mm*97mm*97mm Measuring scale : ±300µA

Accuracy : 2.5% on full deflection Scale length : 75mm

Material : Plastic

4mm socket terminals Complete with zero adjuster Weight : 0.4kg

ESP59414

Digital Galvanometer DC

- Display:4.5 Inch with 4 segment LCD display
- Measures direct current in micro amperes. It is possible to measure micro-currents in electromagnetic induction experiments and the like. Measuring range: + -1999 -Accuracy: 0.5 class

Internal 9v battery (not included).and external power input termination is via color coded 4mm socket terminals (One year warranty).

ESP59417

Galvanometer Moving Coil ±50µA

DC current measuring instrument on a small scale easy to read Size: Overall 138mm*97mm*97mmMeasuring scale : ±50µA Accuracy: 2.5% on full deflection Scale length: 75mmMaterial: Plastic4mm socket terminals Complete with zero adjuster weight: 0.4kg

ESP59415

Ammeter Dual Range DC

Ampere meter Dual Range DC
Two scales ampere-meter to measure DC Current in electrical work and student experiments
Measuring Scale: 0-500mA/ 0-
5A Scale length: 55mm
Material: Plastic
Zero point position:
Left 4mm socket
terminals
Overload protection and zero adjuster
Dimensions : Overall 160 x 110 x 55mm

ESP59419

Galvanometer

DC current measuring instrument on a small scale. Dual Scale that is easy to read
Measuring scale: -50uA to 50uA
Accuracy: 2.5% on full deflection | Scale length: 75mm | Material: Plastic Internal resistance approximately 1200 ohm, 4mm socket terminals, Complete with overload protection, with zero adjuster
Dimensions : Overall 160 x 110 x 55mm

ESP59413

NEW

Electricity Measuring Tool

Series of physics laboratory electricity measuring tools with feature:

- Rotating coil type, class accuracy 2.5%.
- Resistance is approximately 1200 ohm.
- Large scale, completed with mirror to ease of reading (anti parallax) and zero adjuster bolt.
- 4 mm screwed socket .
- Rigid ABS plastic box, dimension 160 × 110 × 55 mm.

a. Ammeter & Voltmeter 2-1 ESP59449

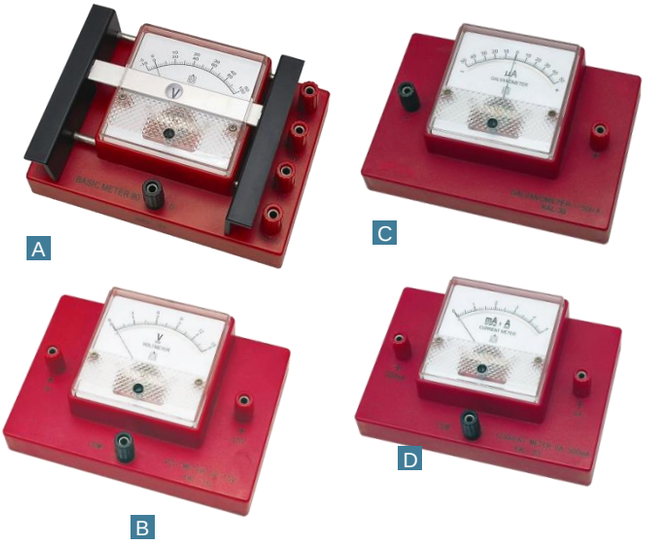
It is used as DC current and voltage measuring tool with shunt and multiplier installed; equipped with slide cover to switch between Ammeter (A position) and Voltmeter (V position); ammeter range: 100 μA - 100 mA - 1 A and 5 A DC; voltmeter range: 100 mV - 1 V - 10 V and 50 V DC.

b. Galvanometer | ESP59413

A small DC current measuring tools; zero center meter type with measuring capacity of -50 μA - +50 μA; equipped with overload protector.

c. Voltmeter | ESP59447/1 ESP59447

Voltmeter with the options with of single scale or dual scales.

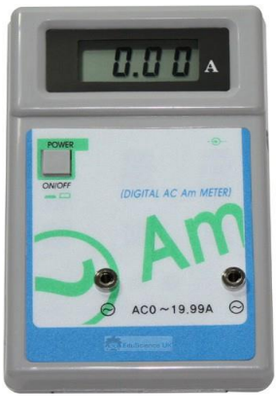


	ESP59432	ESP59419
Type	**Single Scale**	**Dual Scale**
Measuring Scale	**0 - 15 V DC**	**0 - 15 V DC & 0 - 15 V DC**

d. Ammeter | ESP59432 , ESP59419/1 & ESP59419

Ammeter option with a single scale or dual scales

	ESP59432	ESP59419/1	ESP59419
Type	**Single Scale**	**Single Scale**	**Dual Scale**
Measuring Scale	0 - 500 mA DC	0 - 5 A DC	0 - 500 mA and 0 - 5 A



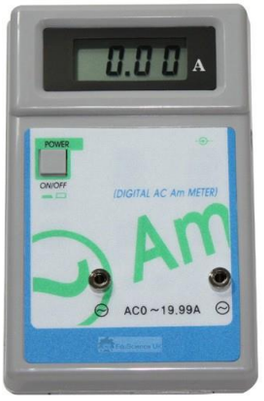
Digital Milliammeter

Range: 0 to 199 A

• Display : 4.5 Inch with 4 segment LCD display .

Internal 9v battery (not included).and external power input Termination is via color coded 4mm socket terminals Precision: 0.5 class (One year warranty).

ESP59422



Ammeter Digital (A.C.)

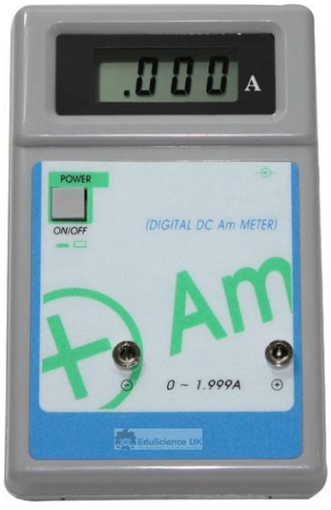
Measuring range: AC 0 ~ 300V Display : 4.5 Inch with 4 segment LCD display .

• Used to measure alternating current (AC).

Accuracy: 0.5 class, voltage (AC) measurement

Internal 9v battery (not included).and external power input termination is via color coded 4mm socket terminals (One year warranty).

ESP59423



Ammeter Digital (D.C)

Digital Ammeter (D.C) , (0 - 1.999 A): An Electronic Ammeter for measuring current Display : 4.5 Inch with 4 segment LCD display

Termination is via color coded 4mm socket terminals

, Precision: 0.5 class .(one year warranty).

ESP59424

Ammeter Digital (D.C)

Digital D.C. Ammeter ideal for school use!

Range: 0-10A D.C. , Resolution: 0.01A, Super strong high grade ABS case Protective display window

Long battery life

Colour coded and shrouded 4mm sockets

Dimensions : 95 x 90 x 75mm

Large bold 14mm digital LCD display

Power: 1 x 9v 'PP3' size battery

ESP59425

Ammeter Analogue (D.C)

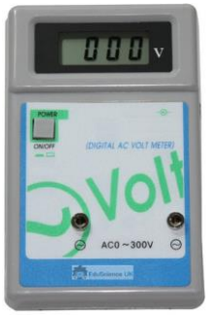
This economical, closed-back student meter offers reliability, ruggedness, and affordability all in one unit. The meter is housed in a durable black plastic case measuring 13.8 cm x 10.0 cm x 9.8 cm. The large 9.5 cm x
8.1 cm clear plastic meter face is designed for easy viewing and has an external zero adjustment. All meter movements are diode protected against overload. Five-way versatile binding posts are simple for students of all levels to use. Accuracy ±2.5% of full scale. Grades 6-12.

ESP59428	Measuring Range : 0-5 A
ESP59429	Measuring Range : 0-3 A
ESP59430	Measuring Range : 0-1 A
ESP59431	Measuring Range : 0 - 10 A

Digital Millivoltmeter (D.C)

Range: 0 to 1999 MV. DC
Frequency response, ±2%: 0 to 10kHz.
Display : 4.5 Inch with 4 segment LCD display
Battery: Internal 9v battery (not included).and external power input Termination is via color coded 4mm socket terminals
Precision: 0.5 class.

ESP59433



Voltmeter Digital (D.C)

Digital VOLTMETER (D.C) ,
(0.01- 19.99v): An
Electronic VOLTMETER for measuring voltage
Display: 31/2 , 4 segmented LCD display , Precision: 0.5 class Overload termination is via color coded 4mm
Socket terminals. Battery : Internal 9v battery (not included). (One year warranty).

ESP59436

Voltmeter Digital (A.C.)

A.C. Voltmeter Range: 0 to 300 V AC
Display: 31/2 , 4 segmented LCD display
Battery: Internal 9v battery (not included).and external power input Termination is via color coded 4mm socket terminals
Accuracy: 0.5. Class

ESP59435

NEW

Digital Voltmeter (D.C)
(0-199.9V) ES-DCV1D

An electronic Ammeter for measuring current , general accuracy is 0.5% , LED display Overload protection Safety socket connection Suitable for school experiment

ESP59437

Voltmeter Analogue (D.C)

This economical, closed-back student meter offers reliability, ruggedness, and affordability all in one unit. The meter is housed in a durable black plastic case measuring 13.8 cm x 10.0 cm x 9.8 cm. The large 9.5 cm x 8.1 cm clear plastic meter face is designed for easy viewing and has an external zero adjustment. All meter movements are diode protected against overload. Five-way versatile binding posts are simple for students of all levels to use. Accuracy ±2.5% of full scale. Grades 6-12.

ESP59440	Measuring Range : 0-1 V
ESP59441	Measuring Range : 0-10 V
ESP59442	Measuring Range : 0-15 V
ESP59443	Measuring Range : 0-5 V

Voltmeter Analogue Dual Range (D.C)

This economical, closed-back student meter offers reliability, ruggedness, and affordability all in one unit. The meter is housed in a durable black plastic case measuring 13.8 cm x 10.0 cm x 9.8 cm. The large 9.5 cm x 8.1 cm clear plastic meter face is designed for easy viewing and has an external zero adjustment. All meter movements are diode protected against overload. Five-way versatile binding posts are simple for students of all levels to use. Accuracy ±2.5% of full scale. Grades 6-12.

0-5 V/500V	**ESP59445**
0-3 V/15V	**ESP59446**
0-5 V/15 V	**ESP59447**

Voltmeter Digital (D.C)

Digital D.C. Voltmeter Purpose
made for school use Range : 0-
20V D.C.
Resolution : 0.01V D.C.
Super strong high grade ABS case Protective display window, Long battery life
Colour coded and shrouded 4mm sockets
Screw locking battery compartment
Theft deterrent 'SCHOOL' Voltmeter printed on model
Large bold 14mm digital LCD display
Power: 1 x 9v 'PP£' size battery (inc.), Full 12 month guarantee
Dimensions : 95 x 90 x 75mm

ESP59439

Digital Voltmeter 20V AC

Digital Voltmeter 20V AC

A digital voltmeter able to measure to 19.99V a.c. with a resolution of 0.01V (IPC-1505-M). The 3½ digit liquid crystal display has 13mm high digits with a wide field of view unobscured by trailing leads. The display also provides indication of polarity and low battery. The unit is exceptionally easy to read. Two colour coded 4mm sockets are located on thesides for maximum convenience and anti-slip feet are fitted to the base. Low operating current gives expected battery life in excess of 500 hours. Housed in a robust ABS case. Supplied with battery.
Description : Voltmeter 20V ac
Part Number : IPC-1505-M
Electrical Supply : 9V
Battery, type: PP3
Dimensions : 130 x 60 x 90mm overall
Mass : 0.18kg
Range : 0 to 19.99V
Resolution : 0.01V (10mV)
Input Resistance : 1MΩ - Overload : 10 x full scale
Accuracy : ±1 digit, ±0.1% of full scale

ESP59438

NEW

Electric Tester Pen Type Meter

Pen shaped tester with plastic material housing and LCD screen , used to test voltage Breakpoint ,direct current , alternating current and high voltage .
SPECIFICATIONS :
DC Voltage 200mV/2V/20V/200V/600V ±(0.7%+2)
AC Voltage
200mV/2V/20V/200V ±(0.8%+3)
600V ±(1.0%+3)
DC Current 20mA/200mA ±(1.5%+3)
AC Current 20mA/200mA ±(2.0%+3)
Resistance(Ω)
200Ω/2kΩ/20kΩ/200kΩ/2MΩ ±(1.0%+3)
20MΩ±(1.0%+5)

ESP59363

Ohmmeter Demo Unit

Demonstration meter for measuring resistance and for testing diodes, the component to be measured is connected to the two 4-mm safety jacks, this instrument is easy to transport and can be mounted magnetically, the 26-mm LED display showing the measured value and the 20-mm LED display for the measurement unit allow readings to be taken easily even at a distance

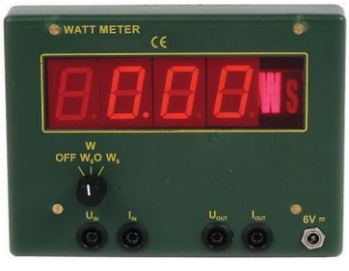
TECHNICAL DATA :

Display: 3 1/2-digit LED display, digit height 26 mm
Measuring ranges: 200 Ohms, 2, 20, 200, kOhms, 2 MOhms, 2 V (diode testing)
Accuracy: ±0.2 % ±1 digit for all ohmage ranges up to 200 kOhms, beyond that

ESP60253

Coulombmeter Range 0 to 1999nC. Accuracy : ±10% of F.S.D. Overload capability : 100V.
Frequency response, ±2% : 0 to 10kHz.
Display : 31/2 digit LCD with polarity and low battery indication. Battery : Internal 9v battery PP3 or equivalent (not included).
Expected Battery life : 5000 hours.
Automatic switch off after 50 minutes of inactivity. Accuracy : +1% of full scale indication typical.

ESP59453



Wattmeter Demo Unit

Demonstration instrument for measuring power in low-voltage circuits, very easy to transport and magnetically mountable, the 26-mm LED display showing the measured value and the 20-mm LED display for the measurement unit allow precise readings to be taken even at a distance

TECHNICAL DATA :

Display: 3 1/2-digit LED display, digit height 26 mm Input: 4-mm safety jacks (pair)
Types of measurement: true power (W), work/energy (Ws) Measurement limits: 20 Veff, 2 Aeff

ESP60256

Coulombmeter Digital

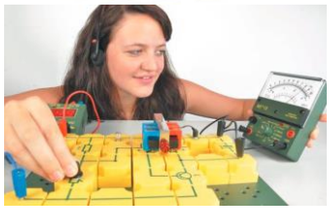
NEW

Useful for a wide range of experimental applications including charging by induction, Faradays ice pails, Coulomb's law and capacitance of an isolated sphere. The 3½ digit liquid crystal display has 13mm high digits with a wide field of view unobscured by trailing leads. The display also provides indication of polarity and low battery. The unit is exceptionally easy to read. Two colour coded 4mm sockets are located on the sides for maximum convenience and anti-slip feet are fitted to the base. Low operating current gives expected battery life in excess of 500 hours. Housed in a robust, ABS plastic case. Supplied with charge plate, battery and instructions.

A document containing descriptions of a number of standard experiments and investigations which can be performed using this Digital Coulombmeter has been compiled by us. Description : Coulombmeter - Electrical Supply : 9V - Battery, type: PP3 - Dimensions : 130 x 60 x 90mm overall - Mass : 0.20kg - Range : 0 to 1999nC - Resolution : 1nC - Overload : 10 x full scale - Accuracy : ±10% of full scale - Input Resistance : 100GΩ - Leakage Current : 1pA (10pA max.) - Charge Storage : 4.7µF

ESP60259

Student Electronics supplement kit



Kit consisting of:
1x PIB resistor 10 kOhm 1x PIB resistor 47 kOhm 1x PIB rheostat 10 kOhm 2x PIB wire, straight
1x PIB photo resistor (LDR) 1x PIB varistor (VDR)
1x PIB NTC resistor 1x PIB PTC resistor 1x Headphone, SE
1x PIB capacitor 0.1 µF 1x PIB capacitor 1 µF 1x PIB capacitor 2 µF 1x PIB capacitor 10 µF 1x capacitor 100 µF
1x PIB capacitor 1000 µF
1x Solar cell, in plastic housing 1x PIB bridge rectifier
1x PIB potentiometer 470 Ohm 1x PIB wire with jack bush
1x PIB buzzer
1x PIB Zener diode 4.7 V 2x PIB Si diode
1x PIB transistor NPN, base right 1x PIB transistor NPN, base left 1x PIB transistor PNP, base left 1x
MBC microphone
2x PIB LED red

Storage:
1x Box insert Electronics, plastic
1x Storage box II small, with cover
Box insert plan with 2 labels

ESP59505

ESP59507

ESP59508

Build A Crystal Radio With An Amplifier - Single Kit

Students explore wavelength, frequency and amplitude while immersed in hands-on experimentation. As students build their own old fashioned Crystal Radios, they explore the effects of coil design variations, building materials, and antennae number and length, on maximizing tuning and signal strength. Then students upgrade their crystal radio into a transistor radio. Ideal for hands on learners, as intuition plays a role in developing antenna design solutions, iterative testing, and making modifications for improvements. Great for introducing guided inquiry-based learning. Includes a complete instructor's manual with reproducible stepwise student protocols. Designed for working in groups of four. Grades 7-10

ESP59507	Single Kit
ESP59508	Class-pack

ESP59504

ESP59503

Building Simple DC Circuits

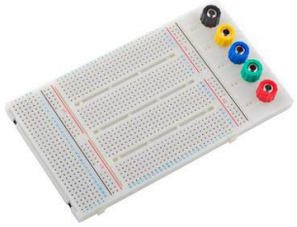
Teach simple DC circuitry using actual components so students can relate it to real world applications. Kits include solder-less breadboards for hands-on exercises. Students learn to build circuits, read circuit diagrams, and investigate the effects of resistors and LEDs in series and parallel circuits. Instructor's manual is comprehensive from lesson plans through assessment. Includes reproducible stepwise student instructions, simple circuit diagrams, and complete answer keys. Middle and high school assignments are provided. Either kit includes one digital multimeter for demonstrating how to measure voltage, current, and resistance for data collection. Designed for working in groups of four. Grades 7-10

ESP59503	Class-pack
ESP59504	Single-pack

Bread Board 94 Holes

Bread Board is an ideal tool for carrying out small Electronic /Electrical experiments. 94 hols which are useful for fixing the components such as IC'S, Transistors, Resistances, Diodes & Capacitors etc points which are useful for fixing the components such as IC'S, Transistors, Resistances, Diodes & Capacitors etc.

ESP59554



Bread Board & Jumper Wire Deluxe Set

Bread Board is an ideal tool for carrying out small Electronic /Electrical experiments. It provides the following

1- 1600 spring loaded points which are useful for fixing the components such as IC'S, Transistors, Resistances, Diodes & Capacitors etc.

2. Interconnecting columns for supply & common / earth points.

3. Three 4mm Sockets are mounted on PCB with additional pins for connections. These sockets are primarily used for (+ve, -ve & Common) Power Supply.

4. Set of 150 wires (Singe Strands) of different lengths & 10 nos. with connector on one side (Pin on one side & Female Connector on other side.)

ESP59556

Bread Board & Jumper Wire Set

Bread Board is an ideal tool for carrying out small Electronic /Electrical experiments. It provides the following facilities.1. Spring loaded 1600 points which are useful for fixing the components such as IC'S, Transistors, Resistances, Diodes & Capacitors etc.2. Interconnecting columns for supply & common / earth points.3. Three 4mm Sockets are mounted on PCB with additional pins for connections. These sockets are primarily used for (+ve, -ve & Common) Power Supply.4. Set of 150 wires (Singe Strands) of different lengths & 10 nos. With connector on one side (Pin on one side & Female Connector on other side.)

ESP59557

Resistor 10 OHM, 5W Fixed

Fixed Resistor 10 Ohm, 5W
Overall **Dimensions :** 9.9 x 9.9 x 4.7cm
Fixed resistors with power dissipation
5W
Mounted on plastic base with screw 4mm socket terminals

ESP59510

Carbon Film Resistors

1/4W Carbon Film Resistors different values PK/50 Each

ESP59513	1R	**ESP59526**	150R	**ESP59539**	22K
ESP59514	1R5	**ESP59527**	220R	**ESP59540**	33K
ESP59515	2R2	**ESP59528**	330R,	**ESP59541**	47K
ESP59516	3R3	**ESP59529**	470R	**ESP59542**	68K,
ESP59517	4R7	**ESP59530**	680R	**ESP59543**	100K
ESP59518	6R8	**ESP59531**	1K	**ESP59544**	150K
ESP59519	10R	**ESP59532**	1K5	**ESP59545**	220K
ESP59520	15R	**ESP59533**	2K2	**ESP59546**	330K
ESP59521	22R	**ESP59534**	3K3	**ESP59547**	470K
ESP59522	33R	**ESP59535**	4K7	**ESP59548**	680K
ESP59523	47R	**ESP59536**	6K8,	**ESP59549**	1M
ESP59524	68R	**ESP59537**	10K	**ESP59550**	1M5
ESP59525	100R	**ESP59538**	15K	**ESP59551**	10M.

Sequential Logic Tutor

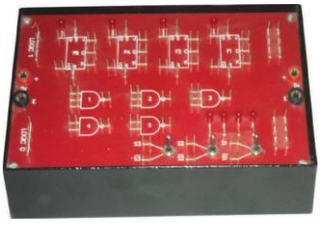
Everything you need for a first course in flip-flops, counters and shift registers. Has four J-K flip-flops, five NAND gates and three Logic Input Switches. One switch is "de-bounced" and can be used for pulsing counters, shift registers etc.
The instruction manual include R-S, J-K and D-Type flip-flops, Binary and BCD Counters, Shift Register, Ring Counter, Johnson Code Counter and Chain Code Generator.

ESP59563

Combination Logic Tutor

Lt1 has a selection of AND, OR, NOT, NAND, NOR, Ex-OR and AND-OR-NOT logic gates to cover all aspects of combinational logic and Boolean algebra. Also has four logic indicators and logic input switches, one of which is "de-bounced".

ESP59564

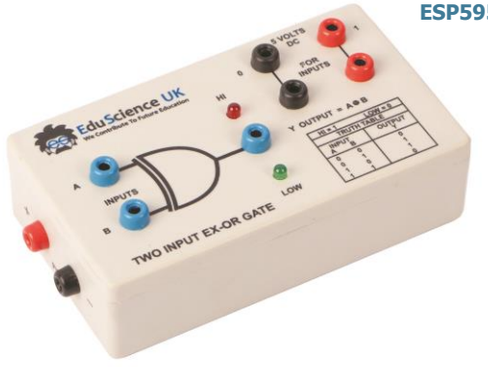


NEW

Logic Gate Module OR Gate

These gates have IC based design with HI / LOW output states indicated by different colored LEDs.
Housed in a sturdy sheet metal box with rubber feet, all modules have truth tables along with necessary details clearly printed on top. Input and output through 4 mm sockets in different colors for easy identification. Input of 5V DC can be connected via input sockets.

ESP59565



Logic Gate Module Ex OR Gate

These gates have IC based design with HI / LOW output states indicated by different colored LEDs.
Housed in a sturdy sheet metal box with rubber feet, all modules have truth tables along with necessary details clearly printed on top. Input and output through 4 mm sockets in different colors for easy identification. Input of 5V DC can be connected via input sockets

ESP59559

Logic Gate Module Ex Logic Gate Module NAND Gate

These gates have IC based design with HI / LOW output states indicated by different colored LEDs.
Housed in a sturdy sheet metal box with rubber feet, all modules have truth tables along with necessary details clearly printed on top. Input and output through 4 mm sockets in different colors for easy identification. Input of 5V DC can be connected via input sockets

ESP59561

Logic Gate Module And Gate

these gates have IC based design with HI / LOW output states indicated by different colored LEDs.
Housed in a sturdy sheet metal box with rubber feet, all modules have truth tables along with necessary details clearly printed on top. Input and output through 4 mm sockets in different colors for easy identification .Input of 5V DC can be connected via input socket

ESP59558

Logic Gate Module Invertor

These gates have IC based design with HI / LOW output states indicated by different coloured LEDs.Housed in a sturdy sheet metal box with rubber feet, all modules have truth tables along with necessary details clearly printed on top.Input and output through 4 mm sockets in different colours for easy identification. Input of 5V DC can be connected via input sockets

ESP59560

Logic Gate Module NOR Gate

These gates have IC based design with HI / LOW output states indicated by different colored LEDs.
Housed in a sturdy sheet metal box with rubber feet, all modules have truth tables along with necessary details clearly printed on top. Input and output through 4 mm sockets in different colors for easy identification. Input of 5V DC can be connected via input socket

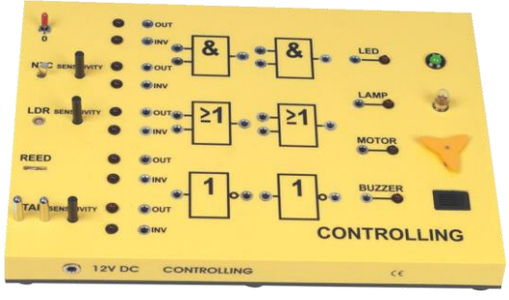
ESP59562

Numerical Systems

This panel is used to demonstrate the number systems used in information technology (binary and hexadecimal numbers). Range: 0 ... 255 or 8 bits Toggle switches are used to activate the displays showing the particular number entered. Input may be entered either as decimal or binary numbers with a toggle switch for mode selection. Three rotating knobs are available for selecting decimal digits, while binary numbers are entered by setting toggle switches. Numbers are shown on two displays: a three-digit, seven-segment LED display (26 mm) for decimal numbers and a two-digit alphanumeric display for hexadecimal numbers (22 mm). Eight LEDs (5 mm) display binary values.

Additionally required : ESP59571 Mains transformer 12 V DC / 2A

ESP59566



Controlling

This panel is used to demonstrate practical applications of digital technology in electronic and electromechanical control systems, such as motor control, a model of an alarm system and other circuits (instructions for 12 example circuits).

Input may be selected from five different, independent signal sources: a toggle switch; an NTC thermistor, used as a temperature sensor; an LDR, used as a light detector; a Reed relay contact (gas-filled magnetic switch); and a pressure-sensitive contact.

All output is accessible either as a direct or inverted signal and the current state is displayed in each case by an LED.

Output terminals are protected against short-circuiting and suited to being directly connected to the logic gates.

Logic gates: 2 NOT gates, 2 AND gates and 2 OR gates.

Four control elements are available for each output signal: an LED (5 mm, green), an E10 light bulb, a drive motor and an electromechanical buzzer. Current output state is displayed by LEDs.

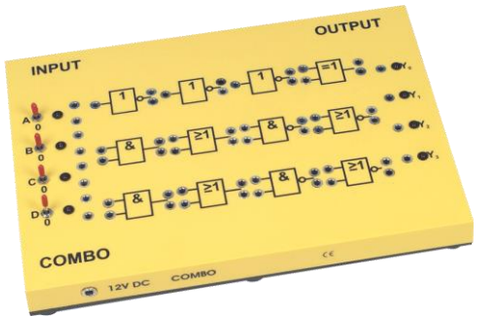
Additional devices, such as a logic analyser, may be connected by means of the 4-mm jacks.

See following for a list of possible experiments.

Additionally required :

1x transformer 12 V DC / 2 A ESP59571
2x Connecting leads, 25 cm, black, set
of 6 1x Bar magnet, round, 10 x 50 mm
1x Light bulb, 10 V / 50 mA, E10

ESP59568



Combo

Introduction to basic logical expressions, combining logic gates, circuit design of EXOR gates, De Morgan's law, full and half adders, verifying the laws of Boolean algebra, coder and decoder circuits and RS flip flops (instructions for 30 example circuits).

This panel includes the following logic gates: 2 AND gates, 2 OR gates, 2 NAND gates, 2 NOR gates, 1 EXOR gate as well as, 3 NOT gates

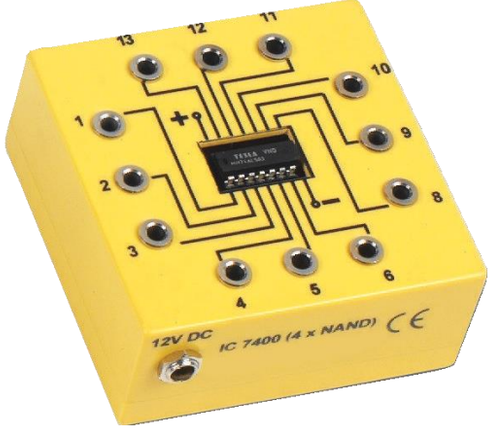
Input: four toggle switches with 5-mm LED
displays Output: four 5-mm LEDs with 4-mm jacks

Input and output elements as well as the individual gates are connected by means of 4-mm connecting leads.

Additional devices, such as a logic analyser, may be connected by means of the 4-mm jacks.

Additionally required : 3x Connecting leads, 25 cm, black, set of 6, 1x Mains transformer 12 V DC / 2 A - ESP59571

ESP59567



IC-7400 (4 x NAND)

This industry-standard IC (IC 7400) may be controlled by means of 12 4-mm jacks.

Integrated Schmitt trigger circuits allow for a variety of digital and analogue signal sources to be directly

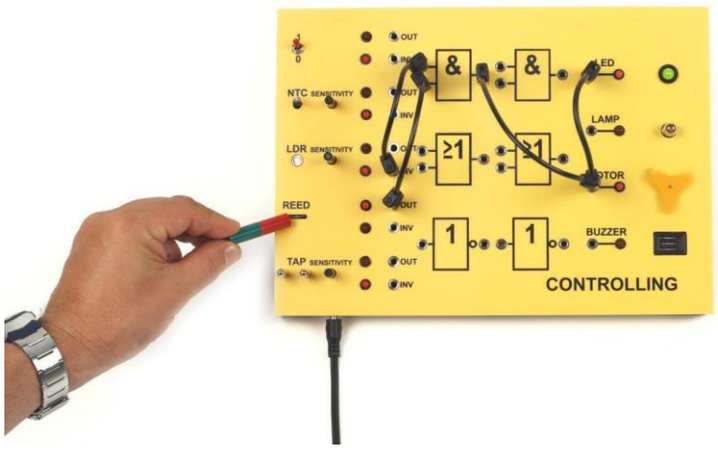
Connected to it (ON-OFF or Reed switch, NTC, PTC, LDR etc.).

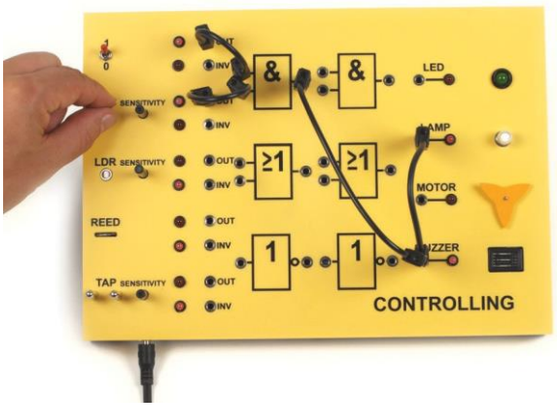
This module is designed to demonstrate the relationship between simple logic gates and industrial applications of integrated circuits.

Additionally required :

1x ESP59567 Combo or, 1x ESP59568 Controlling, 1x Junction cable, 4 DC plugs, 2x Connecting leads, 25 cm, black, set of 6, 1x Bar magnet, round, 10 x 50 mm, 1x Mains transformer 12 V DC / 2 A ESP59571, 1x Light bulb, 10 V / 50 mA, E10,

ESP59569





Experiment manual "Logic", b/w booklet

Experiment topics:
Numerical Systems ESP59566 (4 experiments): Decimal number system
Binary number system
Hexadecimal number system
Converting between number systems
COMBO ESP59567 (30 experiments): NOT gate
AND gate
OR gate
NAND gate
NAND gate from AND and NOT gates NOR gate
NOR gate from OR and NOT gates EXOR gate
EXOR gate 1 (with AND gate) EXOR gate 2 (with OR gate) NOT gate from NAND gates AND gate from NAND gates OR gate from NAND gates NOT gate from NOR gates AND gate from NOR gates OR gate from NOR gates
De Morgan 1 (NAND) De Morgan 2 (NOR)
RS flip-flop from 2 NAND gates RS flip-flop from 2 NOR gates
RS flip-flop (NAND) with a switch and cycle RS flip-flop (NOR) with a switch and cycle
D flip-flop from NAND gates D flip-flop from NOR gates Half adder 1
Half adder 2
Half adder with EXOR gate Full adder
Coder circuit (decimal - binary) Decoder circuit (binary - decimal)
CONTROLLING ESP59568 (12 experiments): Door control
Motor control Light control
Double security circuit Heating control Thermal protection Fire detector
Air conditioning control Alarm system 1
IC 7400 (4 x NAND) ESP59569 (6 experiments): AND from 2 NANDs NOT from 2 NANDs NAND from 2 NANDs NOR from 3 NANDs OR from 3 NANDs
Fire detector (AND from 2 NANDs) Light control (OR from 3 NANDs)
Alarm system 2
Washing machine control Refrigerator control

ESP59570

Mains transformer 12V DC / 2A

Output voltage : 12 V DC / 24 VA supplied by 5.5-mm hollow DC plug Voltage source : 100 ... 240 V AC / 50 ... 60 Hz
Dimensions : approx. 90 x 60 x 37 mm

ESP59571

Connecting leads

Connecting leads, 25 cm, black, set of 6 (Lt)

ESP59572

PNP TRANSISTOR

PNP Transistor is mounted on a specially designed transparent base for studying its characteristics in forward and reverse biasing. 4mm safety sockets are provided for connections.

ESP59552

Model Fuse - fuse wire between to croc clips

ESP59577

Semiconductor Germanium Diode Unit

Mounted on transparent base, with 4 mm colour coded sockets, with circuit diagram printed for demonstration.

ESP59612

Light Dependent Resistor Unit LDR in Block

With photo-sensitive resistor mounted on base. Shows that resistance is inversely proportional to light density. With tow 4 mm Sockets

ESP59593

Light Emitting Diode (LED)

5mm standard high quality LED indicators with diffused lens. Maximum voltage 3.0V D.C. PCB or panel mount.

ESP59585	Red
ESP59586	Yellow
ESP59587	Green
ESP59588	White

Light Emitting Diode (LED) On Base

LED mounted on transparent base , high intensity and better light emits consistently with long life , with 4 mm colour coded sockets terminals

ESP59589	Red
ESP59590	Yellow
ESP59591	Green

Light Emitting Diode (LED) On Base

Set of 3 LED (Red, Yellow , Green) each mounted on base , high intensity and better light emits consistently with long life , with 4 mm sockets terminals

ESP59592

Light Dependent Resistor Unit LDR on board

These modules can be utilized for building basic circuits akin to those typically found on a Worcester Circuit Board. Their purpose is to acquaint younger students (ages 11-13) with common applications of devices and circuits, with a primary focus on elementary electrical circuitry. The modules feature 4mm plug connections.
To enhance sensitivity and regulate current in a reed relay, a grouping of three ORP12s is arranged in parallel, resulting in a resistance of around 200 ohms under room lighting conditions.

ESP59593B

Capacitors

Aluminium Electrolytic Capacitor are polarized with tolerance of 10% , Pk/10 Pcs

ESP59594	10 µF
ESP59595	22 µF
ESP59596	47 µF
ESP59597	100 µF
ESP59598	220 µF
ESP59599	330 µF
ESP59600	470 µF

Buzzer

These Simple Circuit modules can be used to construct simple circuits of the type normally implemented on, for example a Worcester Circuit Board. Very useful for younger pupils to learn more applications of circuits and devices. The modules are having 4mm plug connections.

On base. a low current buzzer of 2mA approx. capacity

ESP59611

Bar Magnet

Material: Alnico; poles covered with red or green plastic cap; D = 10 mm, L = 50 mm

ESP59573

Soldering Iron

With wooden / Bakelite handle, lightweight body, element tested for high insulation, with long life pencil bit

ESP59601	25 Watts
ESP59602	65 Watts
ESP59603	125 Watts

Soldering Iron Stand

Soldering iron with stand

ESL57453

De-soldering Pump

High sucking power, plastic body with sturdy metal rod, easy to clean and maintain.

ESP59609

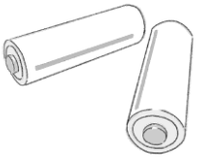
Thermistor Unit

Mounted on transparent base, with 4 mm colour coded sockets. Mounted on transparent base, with 4 mm colour coded sockets, with circuit diagram printed for demonstration

ESP59610

Circuit Breaker

ESP59576



Dry Cell 1.5V

Size : Ø 33 × 60 mm -Type : R20S/D Size - Voltage : 1.5 V

ESP59577

Light bulb

Light bulb, 10 V / 50 mA, E10 (Lt)

ESP59574

Fuses

With transparent glass body, quick blow type, 20mm long

ESP59578	500 MA
ESP59579	1 A
ESP59580	2 A
ESP59581	3 A
ESP59582	5 A

Wire Cutter & Stripper, Deluxe

Self adjusting tools for stripping the wire without damaging the inner core. Strips and cuts wire from 0.2 to 6mm. Suitable for electronics, industrial aviation automobiles and domestic use. Length 175mm.

ESP59608

Wire Cutter & Stripper

Wire Cutter Stripper Tool, For Cutting Wire, Crimping And Stripping Insulated Wire

ESP59609

Lever, Single Kit

The lever kit teaches students through hands-on design, construction, testing, and design iterations. Create the structure with the highest strength to weight
ratio to win this engineering competition! A great way to teach middle school students basic engineering and to learn iteration by studying failure, or teach high school students basic statics, free body diagrams, failure modes, and member sizing calculations while complying with STEM education standards. Includes materials and tools for constructing levers; instruction manual with sample calculations, basswood members, balsa members, adhesive, adjustable cutters, and base material. An ideal training kit for Science Olympiad and other building competitions. Required: electric drill and bit.
Grades 6-12

ESP59613

Lever, Single Kit Refill

Lever, Single Kit Refill. Grades
6-12

ESP59614

Lever Test Kit

The test kit includes everything required to test your levers for competition, except for the ballast (sand), including a test stand that can fit on any table with a lip, a loading block, a boomilever scale, a ballast scale, a scoring sheet, chain, S-hook, bucket, beaker with handle, and plastic trap. Grades 6-12

ESP59615

Boomilever Class Challenge Kit

The boomilever kit teaches engineering through hands-on design, construction, testing, and design iterations. Create the structure with the highest strength to weight ratio to win this engineering competition! A great way to teach middle school students basic engineering and to learn iteration by studying failure, or teach high school students basic statics, free body diagrams, failure modes, and member sizing calculations while complying with STEM education standards. Includes materials and tools for constructing boomilevers instruction manual with sample calculations, basswood members, balsa members, adhesive, adjustable cutters, and base material. An ideal training kit for Science Olympiad and other building competitions. Required: electric drill and bit. Grades 6-12

ESP59617

Boomilever Class Challenge Kit Refill

Boomilever Class Challenge Kit Refill. Grades 6-12

ESP59618

Structure and Bridges Classroom Kit

Gain a comprehensive understanding of structural engineering and learn how engineering concepts are applied in supporting or resisting loads. The class will study different types of bridges and the STEM principles that support their designs. During the unit, students will construct six working models including a house, a suspension bridge, a cable-stayed bridge, an arch bridge and two different truss bridges. They will also be challenged to build the largest free standing tower possible using the Engino? Components included in the kit. Finally, the students will apply their new knowledge to design and build a straw bridge that spans 70 cm and will support a minimum 2 kg distributed static load using only 100 plastic straws and a limited amount of masking tape. Includes all building and testing materials, instructor's manual, lesson plans, Engino hands-on activity books, building instructions, and student worksheets. Grades 7-12

ESP59620

Heat Kit Simple

Ideal for use by Primary School students, aged 6 - 12 years. The student will be able to understand the basic knowledge on heat characteristics of materials and their conductivities with respect to heat. The experiments can be performed by the students themselves using their own ideas.

Experiment topics:

Expansion of water by heat, Expansion and contraction of air by changing temperature, Heat convection, Heat conduction, Heat conductors and insulators.

Specification:

Made with high quality standard.

The kit contains:

1 complete stand (Code # 9601410), 1 copper rod (Code # 9601421), 1 steel rod (Code # 82120284), 1 glass rod (Code # 9601423), 1 250 ml Erlenmeyer flask, 1 Rubber stopper with two holes dia 27/35 x 35mm, Grey, 1 Plastic Pipe OD=4mm, ID=3mm, P=170mm,1 thermometer -10 ~ 110 C, A1.5 C, Red Spirit, 1 manometer holder (Code # 9601422), 3 plastic pipe OD=4mm, ID=3mm, P=115mm, 2 Rubber Pipe OD=4mm, ID=3mm, P=60mm, 1 spirit burner, 1 Balloon, Equipped with storage box, **Dimensions :** (L) 10.00 x (W) 11.00 x (H) 26.00cm, **Weight:** 0.470kg

ESP59648

Ignition Kit Smart case

A great way to show students the relationship between volume and temperature in real-life. Our complete kit demonstrating the principles of an internal diesel and petrol combustion engine now supplied in an easy store Gratnell Smart Case. These experiments allow the student to explore volume pressure and temperature gas laws as part of the current GCSE curriculum.

Our kit comprises of the following:

1 x Fire syringe

When the plunger in the TRANSPARENT cylinder is rapidly pushed down over a piece of cotton an ignition occurs. This is one of the most impressive demonstrations of the heat produced when a gas is rapidly compressed - the principle of the Diesel engine ignition. Safety Glasses required. Approximately 22 cm tall.

1 x Ignition cylinder

A tough strong clear acrylic tube that when the propellant is sprayed into the tube and mixed with air then sealed with our foam bung and lit underneath produces an amazing 'POP' where the air and propellant mixture creates an explosion similar to that of a petrol engine. A fantastic experiment that students love.

1 x Gratnells Smart Case, 2 x Spare Fire syringe seals, 1 x Cotton wool sample, 2 x Foam plugs, 1 x Lighter, 1 x Atomizer *(supplied empty), 1 x Pair safety goggles,

*Ignition cylinder requires cyclohexane as a recommended fuel.

ESP59650

Fire Piston

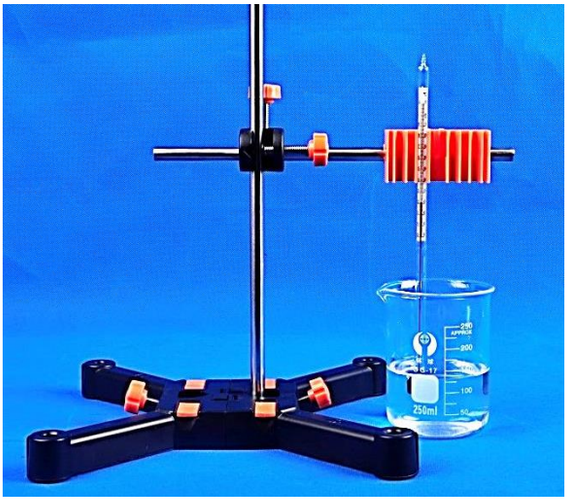
Turn on to Ideal Gas Law with this explosive demonstration! As air compresses, the temperature increases and combustible material bursts into flames. Also is great for discussing adiabatic compression (rapid compression that raises air temperature) in diesel engines, the laws of thermodynamics and the resourcefulness of ancient people. The kit includes aluminium piston, cotton, two custom O-rings, and instructions. Includes Teacher's Guide.

ESP59654

ESS HEAT 1 KIT PC

Kit consisting of :
(01) Support base,variable
(02) Boss head
(03) Fishing line,l= 20m
(04) Support rod,l=400mm,d=10mm
Support rod,l=412mm,d=10mm
Support rod,l=250mm,da=10mm
(05) Electronic thermometer
(06) Calorimeter
(07) Glass beaker,400ml
Glass beaker,250ml
Plastic beaker,100ml
Erlenmeyer flask,100ml
(08) Erlenmeyer flask,250ml
Rubber stopper 26/30, 2 holes 7mm
(09) Measuring tape,l=2m
(10) Digital stop watch,24h,1/100s &1s
(11) Rubber stopper 26/30, 1 holes 7mm
(12) Graduated cylinder,100ml,transparent
Pipette with rubber bulb
Glass tube, straight, d = 8 mm,l=80 mm Spoon, with spatula end, plastic
Glass tube, straight
(13) Wire Gauze with Ceramic Centre
Connecting lead 50 cm,red,4mm
Connecting lead 50 cm,black,4mm
(14) Students thermometer,-20...+110°C,l=300mm
(15) Silicone tubing, di=6mm
(16) Universal clamp
Iron ring
Iron ring
(17) Fahrenheit thermometer

ESP59649



Support Tools (sold separately) :
Bunsen Burner
Digital Scale
Spatula with Spoon
Test Tube 16x160mm
Student Power Supply AC/DC 0-12V 5 AMP
Spirit Burner
Glass Tubes

List of Experiments :

You can perform the following experiments :
1.1 Determination of specific heat capacity of solids
1.2 Practice using a thermometer
1.3 skin heat sensitivity
1.4 Study the melting and solidification process of crystals
1.5 Exploring the main factors affecting the speed of diffusion
1.6 Exploring the heat absorption power of different substances
1.7 Gravity when the glass plate is off the water surface
1.9 Demonstration between the molecules
1.9 Demonstrate work to change internal energy
1.10 demonstrates the conversion of internal energy and mechanical energy

Senior High School

Hydrostatics and Heat Kit

ESP59651

- The guide book consists of 28 experiments.
- The experiments are related to the substance (liquid) characteristic, temperature measurement, heat conduction, and pump (jack) principle work.

Component List

Consists of 37 components, packed in a plastic injection moulding box. Dimensions: 61 x 26 x 17 cm. Weight: 3.1 kg.

Cat. code	Component	Qty	Cat. code	Component	Qty
FSC 7	Overflow Vessel	1 pc	FPA 12.04/21	Copper Pipe	1 pc
ESL56548	Beaker 250 ml	1 pc	FPA 12.10/51	Silicone Tubing	1 pc
ESL56519	Measuring Cylinder 100 ml, Plastic	1 pc	TL000228	Spirit Burner 80 ml, Stainless Steel	1 pc
FSP 11.05/43	Transparent Plastic Hose 500 mm	2 pcs	MI000236	Alcohol Thermometer -10°C - 110°C	2 pcs
ESP 11.08/47	Plastic Funnel 70 mm	1 pc	MI000234	Alcohol Thermometer 0°F - 250°F	1 pc
FSP 11.09/48	Support Clamp	1 pc	MI000237	Alcohol Thermometer without Scale	1 pc
ESP 11.10/49	Hose Connector	2 pcs	GW000175	Test Tube Ø 12 x 100 mm KTA 40/100.012	2 pcs
PMF 125	Pressure Probe	2 pcs	KSM 13/17-22	Rubber Stopper with One Hole, Ø 17/22 mm	2 pcs
ESP 11.13/55	Plastic Tube with Hanger	1 pc	KSM 14/29-35	Rubber Stopper with Two Holes, Ø 29/35 mm	2 pcs
FSP 11.14/57	Plastic Tube with Load 120 gr	1 pc	KSM 13/29-35	Rubber Stopper with One Hole, Ø 29/35 mm	3 pcs
ESL56413	Erlenmeyer Flask 100 ml	3 pcs	KSM 12/17-22	Rubber Stopper without Hole, Ø 17/22 mm	2 pcs
BFS 63/07-250	Capillary Pipe with Scale Ø 7 x 250 mm	1 pc	FSP 11.16/135	Multipurpose Glass Body Length 10 cm and marble	2 pcs
PHE 241	Plastic Basin	1 pc	FPA 12.04/21	Copper Pipe	1 pc
FPA 13	Special Pointer	1 pc	FPA 12.10/51	Silicone Tubing	1 pc
FPA 12.02/19	Steel Pipe	1 pc	TL000228	Spirit Burner 80 ml, Stainless Steel	1 pc
FPA 12.03/20	Aluminum Pipe	1 pc	MI000236	Alcohol Thermometer -10°C - 110°C	2 pcs

Physics Experiment Kit

Cat. code	Component	Qty
TL000121	Bosshead Clamp	2 pcs
FSP 11.17/137	Marble	2 pcs
FPA 12.05/22	Heat-Air and Liquid Circulation System	1 pc
FPA 12.09/41	Propeller	1 pc
FPA 12.08/40	Steel Needle for Propeller	1 pc
FPA 12.07/30	Radiation detector	1 pc

Supporting Components

Available in the Mechanic kit PMS 107.

Cat. code	Component	Qty
GSN 180	Stand Base with 3 Clamps	2 pcs
FME 51.02	Stand Foot	2 pcs
KST 30/250	Stand Rod 0 10x 250 mm, Stainless Steel	2 pcs
KST 30/500	Stand Rod 0 10 x 500 mm, Stainless Steel	2 pcs
FME 51.05/05	Support Block	2 pcs
FME 51.07/07	Dynamometer 1.5 N	1 pc
FME 51.14/23	Holding Clamp	3 pcs
FME 51.08/09	Nylon Thread	1 pc
FME 51.09/10	Load 50 gr	6 pcs
ESL57745	Analog Stopwatch	1 pc
KMS 15/305	Ruler 50 cm, Stainless steel	1 pc

Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. code	Component	Qty
ESP 23	Balance 311 g	1 pc

Experiment Topics

HP1	Cohesion and Adhesion
HP2	Capillarity
HP3	Hydrostatic Pressure
HP4	Connected Vessels
HP5	Buoyancy of Liquid
HP6	Archimedes' Principle
HP7	Sinking/Floating/Swimming
HP8	Hydraulic Pump
HP9	Water Pump
HP10	Filtration
HP11	Water Purification by Filtration
HP12	Temperature Measurement
HP13	Comparing Celsius and Fahrenheit Thermometer
HP14	Calibration of a Thermometer
HP15	Temperature of a Mixture
HP16	Heat
HP17	Matter and It's Changes
HP18	Relation Between Heat and Changes of Matter
HP19	Linear Expansion of Solid Bodies
HP20	Volume Expansion of Liquid
HP21	The Expansion of Gas
HP22	Physical and Chemical Changes
HP23	Properties of the Elements, Compounds, and Mixtures
HP24	Evaporation
HP25	Water Purification by Distillation
HP26	Conduction in solids
HP27	Heat Convection in Gas and Liquids
HP28	Thermal Radiation and Heat Absorption

HP 6 Archimedes' Principle

HP 9 Water Pump

HP 16 Heat

Communicating Vessels Experiment Kit
ESP60135

Senior High School

- The Communicating Vessels Experiment Kit consists of a uni-body glass with four openings whom have different neck shapes and sizes.
- This experiment is designed to observe a hydrostatic phenomena between fluid and atmospheric pressure, as well the effect of non-soluble fluids (such as oil and water) to its hydrostatic state.
- This experiment kit also consists of a set of Bernoulli's Tube which can be used to demostrate Bernoulli's principle.

Experiment Topics

E1 Capillarity
E2 Communicating Vessel
E3 Fluid Pressure due to Two Different
E4 Fluids Bernoulli's Tube

Component List

Consisting of 3 components, packed in a plastic injection moulding box. Dimension: 62 × 30× 9 cm. Weight: 2.2 kg.

Cat. code	Component	Description	Qty
ESP 6	Capillarity Apparatus	For the investigation of the relation between capillary rise of liquid and the bore diameter of the capillarity tubes constructed in the form of communicating vessels in which the liquid is contained.	1 pc
ESP 5	Communicating Vessels	To show that the surface of a liquid at rest is always horizontal indpendent of size or shape of vessel.	1 pc
ESP 550	Bernoulli's Tube	To demonstrate Bernoulli's principle.	1 set

Calorimeter Experiment Kit
ESP59660

Senior High School

Calorimeter Experiment Kit is designed to perform a few basic heat experiment such as proving Black's Principle, heat capacity measurement, even the relationship between electrical power dissipation and heat system (Joule calorimeter).

Component List

Consisting of 12 components, packed in a plastic injection moulding box. Dimension: 62 × 30× 9 cm. Weight: 4.2 kg.

Cat. code	Component	Description	Qty
FPA 50	Calorimeter	Double wall, Inner vessel and Outer vessel Complete with insulating cover, aluminium stirrer and rubber stopper with hole for thermometer	1 pc
PHM 152	Joule Calorimeter	Joule Calorimeter with Nickel Heater Complete with aluminium stirrer, rubber stopper with hole for thermometer and nickel-based heater with maximum voltage of 6V	1 pc
FSP 18	Material Samples	Material : Iron, brass, copper, wood and aluminium Cube Size: 20 x 20 x 20 mm	1 set
ESL56548	Beaker Glass 250 ml	Size : Capacity 250 ml Material : Borosilicate glass Low form and with pouring lips	1 pc
FME 51.08/09	Nylon Thread	10 m nylon tread reel.	1 pc
TL000228	Spirit Burner 80 ml, Stainless Steel	Used as spirit burner at laboratorium. • Overall Size: 90 x 69 x 64 mm • Material : Stainless steel With wick and wick regulator	1 pc
KKA 55/80-100	Tripod Stand	To be used with spirit burner. • Ring Size: Ø 100 mm, Height : 80 mm • Material : Steel Ø 8 mm • Color : Black	1 pc
TL000114	Wire Gauze 14 x 14 cm without Ceramic	Used as a pedestal a glass or porcelain when processing warming. Size : 140 x 140 mm Material : Stainless steel	1 pc
MI000236	Alcohol Thermometer -10˚C - 110˚C	Alcohol filled thermometer. • Glass tube ± Ø 6 mm • Length ± 300 mm, with hanger ring at top end • Scale: -10˚ to 110˚C, graduated 1˚C	1 pc
ESP57915	Connecting Lead DC 50 cm, Black	Cable with a total length of 500 mm and maximum current of 8 A. Color: black.	3 pcs
ESP57914	Connecting Lead DC 50 cm, Red	Cable with a total length of 500 mm and maximum current of 8 A. Color: red.	3 pcs
KAL 41	Basic Meter 90	For use to measure voltage and current, DC only, with internal shunt and multiplier. Equipped with sliding switch to change function as voltage or current meter.	2 pcs
FPA 50	Calorimeter	Double wall, Inner vessel and Outer vessel Complete with insulating cover, aluminium stirrer and rubber stopper with hole for thermometer	1 pc

Experiment Topics

E1 Heat Capacity of Calorimeter
E2 Specific Heat
E3 Latent Heat of Melting Ice
E4 Conservation of Energy

Immersion Heater For Calorimeter Block

Specially designed for metal block calorimeters. Heating element enclosed in a metal tube with two connecting leads which are insulated with heat resistant insulation. 12V, 50W.

ESP59667

Calorimeter Block

Metal, for experiments on specific heat of different metals, cylindrical metal clocks 1kg 2%. Each block has a central hole for a special immersion heater and an offset hole for thermometer.

ESP59666

NEW

COLORIMETER JOULES ALIUMINIUM

A calorimeter with a double-walled cover will minimize heat loss. The inner and outer vessels are made of aluminum. The calorimeter has a stirrer and support for the inner vessel. Item is now interchangeable and can be used with or without electricity. Inner vessel capacity: app 300 Ml Including terminal Inner and outer barrel Aluminum cup, with stirrer

ESP59661AL

Colorimeter

ESP59661	Copper joules	CALORIMETER , With φ100*110mm, Height Excluding terminal Inner and outer barrel copper cup, with stirrer.
ESP59662	Copper 75 x 50mm dia.	With parallel sides and rolled rim, without stirrer.
ESP59663	Copper 100 x 75mm dia.	With parallel sides and rolled rim, without stirrer.
ESP59664	Copper 75 x 50mm dia.	Polished Calorimeter as above, fitted with plastic lid fitted with rubber stopper and stirrer.
ESP59665	Copper 100 x 75mm dia.	Polished Calorimeter as above, fitted with plastic lid fitted with rubber stopper and stirrer.

Heating Plate

SCHOTT Ceran glass plate, with grinded edges To be used with plate holder ESP59656 **Dimensions :** 155 x 155 x 4 mm

ESP59657

Plate Holder For Heating Plate

Steel plate support with handle;
Crimped borders ensure that the glass plate or wire gauze
Does not slide when inserted;
Handle : D = 10 mm;
Dimensions : 160 x 160 mm

ESP59656

Boss-head

Boss-head four straight slot. Used to clamp circular and square rod.
Dimentions : Length : 55 mm
Material : Aluminium
Part of Heat and Hydrostatic KIT for Junior High School
Dimensions :
(L) 10.00 x (W) 3.00 x (H) 5.00 cm
Weight : 0.129 kg

ESP59655

NEW

Insulation Jacket 75 mm dia

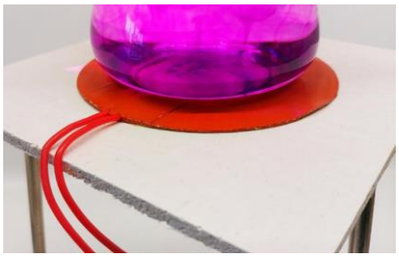
Insulated Jackets made up of a thick felt sleeve and a base mat to fit 75mm diameter calorimeters. Excellent for investigations into insulation and heat loss. PK /5

ESP59668/75

Insulation Jacket 50 mm dia

Insulated Jackets made up of a thick felt sleeve and a base mat to fit 50mm diameter calorimeters. Excellent for investigations into insulation and heat loss. PK /5

ESP59668/50



Heat Pad Irwin Low Voltage Heatproof Mat

The Irwin low voltage versatile heat pad that allows the user to heat up beakers, conical flasks etc. The unit heats up to about 90 degrees Celsius which is great for heating water, boiling alcohol etc. Particularly useful where teaching must be performed in a classroom without a gas supply. The unit is waterproof and splash-proof and so may be used where spillage is possible.
Comes complete with leads. It is supplied bonded to a heatproof mat to protect benches and tables. If the children touch it then reflex action will remove their hand before burning can occur.
Much safer than a Bunsen burner!

ESP59670

Heat Pad Irwin Mains Heatproof Mat

A versatile heat pad that allows the user to heat up beakers, conical flasks etc. The unit heats up to about 90 degrees Celsius which is great for heating water, boiling alcohol etc. Particularly useful where teaching must be performed in a classroom without a gas supply. The unit is waterproof and splash- proof and so may be used where spillage is possible. Comes complete with 1.5m of silicon cable and 13A mains plug.
It is supplied bonded to a heatproof mat to protect benches and tables. If the children touch it then reflex action will remove their hand before burning can occur.
“Much safer than a Bunsen Burner…

ESP59671

NEW

Demo Thermocouple

one each wire copper and constant an ,approx .305 mm
logg , twisted and brazed together

ESP59679

Leslie’s Cube

Metal plate with 130mm sides. The vertical faces of the box are blackened.,
roughened, vanished and polished respectively.
The top opening is 75mm diameter and is fitted with a lid. The apparatus is filled with water maintained at boiling point by a low Bunsen flame. Infra red sensors maybe be used to compare the relative heat output from each of the four faces.

ESP59674

Thermo - octagon

For investigating the thermal radiation from a body as a function of temperature and the kind of radiation surface.
The coloured surfaces get sweep outside for heat radiation, for absorption sweep inside.
Hollow body with 8 surfaces, partially laminated in different colours; heat source mounted on the cover: light bulb 12 V / 20 W;Surfaces : white, black, blue, yellow, red, White - matt finished, nature polished, Nature - matt finished;
Dimensions : approx. 150 x 150 x 105 mm

ESP59675

Wood And Metal Cylinder

To show that metal has a lower specific heat than wood, constructed of wood on one end and hollow metal on the other. One way is to simply let students feel both ends of the cylinder at room temperature, enabling them to see that the metal end is cooler than the wooden end. Another easy demonstration is to wrap paper on both ends and hold the cylinder over a flame for five seconds. The metal end will be relatively unmarked while the wooden end will show scorch marks.

ESP59678

Compound Strip (Bimetallic Strip)

A classic experiment that never grows old. Two metals (Copper and iron) of different heat expansion coefficients welded together and mounted in wooden handle. Demonstrates unequal expansion of different metals by bending when heated.

ESP59676

Radiant Heater

The Irwin Radiant Heat source is a compact and safe heat source for school heat radiation experiments.

It comprises a base and cage containing a custom made infra-red heating lamp of the dull emitter type. The lamp is like the old Griffin lamp but turned inside out. This means that it is impossible to for a pupil to get an electric shock by prodding it with a paper clip etc.

Please note The unit can take up to half an hour to reach maximum temperature and so this time lag should be taken into account when planning lessons.

In normal use, four thermometers, one with a blackened bulb, one with a silvered bulb, one with a white bulb and one with a nude? bulb may be situated around the unit at equal distances and a heat absorption experiment performed. The lamp does not visibly glow as almost all the energy provided is converted into heat. For this reason, a cage has been placed around the lamp to prevent pupils touching it and burning themselves.

However, some experiments require more heat and so the cowl may be removed by unscrewing the four retaining screws. If this is done, the pupils should be warned of the dangers.

Manufactured in the UK

Dimensions: Height: 215mm | Width: 150mm | Depth: 150mm

Weight : 1.5kg

ESP59672

Thermal Conductivity Of Metal Apparatus

The apparatus consists of a wood compound ring with four pointed strips of metal attached at 90 degrees to each other around the ring. The strips are attached so that their points are in the centre of the ring. At the other end of each strip there is an indentation for holding water. Each strip is made of a different metal: Aluminium, brass, copper and iron. Depending on the conductivity of the metal the water will evaporate at different times. Dia.: 130mm

ESP59681

Thermopile "compact"

Thermopile with amplifier to convert the optical power to a voltage value. Serves as a radiation pyrometer with a measuring device 0 ... 10 V or 10 mA; ON / OFF - switch; zero point adjustment; Outputs are protected against short circuit; LED-indicator for operating state; Output voltage: Max ±14 V; battery-driven (battery included) or External power supply 6 - 12 V DC (Not included) **Dimensions :** 84 x 84 x 39 mm

ESP59677

Heat Conductivity Experiment

A very simple to use set of apparatus to compare the heat conductivity of four metal bars.

Four bars, Aluminium, Steel, Copper and Bronze are set into a plastic holder. Each bar has attached to it a solid state thermometer strip. The unit is suspended from a clamp stand with the bar ends dipping into a beaker of very hot water. Comparison of the rate of heat progress along the four bars may be made by direct observation. An elegant solution to an otherwise messy experiment no more Vaseline, steel balls etc.

ESP59680

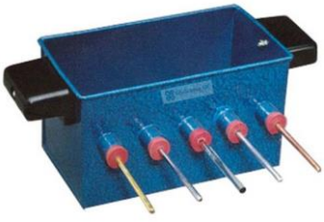
NEW

Heat Conductivity Experiment

A very simple to use set of apparatus to compare the heat conductivity of four metal bars.

Four bars, Aluminium, Steel, Copper and Bronze are set into a plastic holder. Each bar has attached to it a solid state thermometer strip. The unit is suspended from a clamp stand with the bar ends dipping into a beaker of very hot water. Comparison of the rate of heat progress along the four bars may be made by direct observation. An elegant solution to an otherwise messy experiment no more Vaseline, steel balls etc.

ESP59684



Ingen-Hausz Apparatus

To demonstrate different conductivities of different metals. Rods of 5 different metals, fitted along one side of a metal tank. Fitted with 2 Bakelite Handles for easy handling.

ESP59685

Conductivity Of Heat Apparatus

Conduction of Heat Apparatus
4 pieces of metal strips. They have the same form and dimension. For use to show differences in conductivities of various metals.
Dimensions : 125 x 15 x 3mm, mounted on hollow circular wooden base 135mm dia.
Consists of strips of copper, iron, aluminium and brass.
An indentation is made at the outer end of each strip to place wax chips on Heating with spirit or gas burner on the circular tripod
Supplied without tripod and burner
Dimensions : 18.00 (L) x 18.00 (W) x 2.00cm (H) **Weight :** 0.200Kg

ESP59682

Ball And Ring

BALL AND RING, Gravesande's mounted in rod with handle, ball with chain. Cold ball passes through the ring but does not pass when heated.

ESP59689	DIA. 19MM
ESP59690	DIA. 22MM
ESP59691	DIA. 25MM

Bar and Gauge

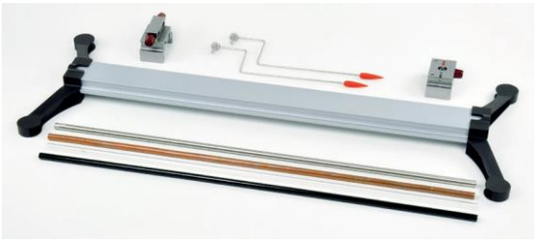
To illustrate expansion of metal on heating and contraction on cooling, with steel bar of length 110 x 10 mm and plated brass gauge with a cut- out to just accommodate the bar and two holes through which the bar passes when cold.

ESP59699

Bar Breaking Apparatus

A heavy cast iron stand slotted to carry a stout iron bar, with ten cast iron breaking bars

ESP59697



Thermal Conductivity Of Metal Apparatus Superior

Consisting of:
1x Stand-rail base, L = 500 mm 2x Rail claw
1x Slider with setting for heat expansion 1x Slider for pointer
1x Tube for heat expansion, aluminium 1x Tube for heat expansion, iron
1x Tube for heat expansion, copper 1x Tube for heat expansion, glass
2x Pointer for heat expansion, Demo

ESP59683

NEW

Constant Volume Thermometer

Consists of a polished teakwood stand approx. 750mm height fitted with a wooden scale reading from 0 to 60cm x 1mm and supporting an adjustable mercury reservoir by a metal rod. A detachable air thermometer bulb about 70mm dia, connected via three way stopcock to mercury tube with zero index lased inside its upper end. A metal vessel surrounding the bulb supported by detachable metal self mounted on insulating asbestos screen. Mounted on a teakwood stand with a deep tray which serves to catch any mercury which has accidentally spilled from the reservoir. Supplied complete with one meter of rubber pressure tubing 10mm O.D. & 5mm bore for connecting the reservoir to the bulb (about 750gm of mercury is required) without mercury.

ESP59669

Thermostat Model

A dramatic demonstration of the thermostat principle. Consists of a bimetallic strip mounted in a base. Because of the unequal expansion of the two different metals, the bimetallic strip will bend to open or close the circuit and the light bulb lights up accordingly.

ESP59687

Thermal Conductivity Of Bar Set

Set considet of 5 Different metal bars : Aliuminium Bar Dia. 3 mm Conductivity 240 Nominal , Brass Bar Dia. 1.5 & 3 mm Conductivity 128 Nominal , Coppe Bar Dia. 1.5 & 3 mm Conductivity 395 Nominal , Iron Bar , Dia. 3 mm Conductivity 0.65 Nominal , Glass Bar Dia. 1.5 & 3 mm Conductivity 72 Nominal

ESP59686

ESP59686A	THERMAL CONDUCTIVITY OF ALIUMINIUM BAR	Aliuminium Bar Dia. 3 mm Conductivity 240 Nominal
ESP59686B	THERMAL CONDUCTIVITY OF BRASS BAR	Brass Bar Dia. 1.5 & 3 mm Conductivity 128 Nominal
ESP59686C	THERMAL CONDUCTIVITY OF COPPER BAR	Coppe Bar Dia. 1.5 & 3 mm Conductivity 395 Nominal
ESP59686I	THERMAL CONDUCTIVITY OF BAR IRON	Iron Bar , Dia. 3 mm Conductivity 0.65 Nominal
ESP59686G	THERMAL CONDUCTIVITY OF BAR GLASS	Glass Bar Dia. 1.5 & 3 mm Conductivity 72 Nominal

Resistance Thermometer

For showing the principles of platinum resistance thermometry and for accurate temperature measurement using a bridge method such as 'Cary-Foster' bridge. The thermometer comprises a length of fine platinum wire of about 2 ohms resistance, wound non-inductively on a mica frame and soldered to stout copper leads. A pair of compensating leads are provided, all four leads being connected to 4 mm socket terminals. Suitable for temperatures up to about 150 degree C only and for low temperature work

ESP59688

Ball And Ring

SPECIFIC HEAT CYLINDERS SET , Comprising Brass, Lead, Iron, Copper, Aluminium and Zinc. Supplied in Case.

ESP59693	Equal in size , size available : 30 x 10mm.
ESP59694	Equal in size , size available : 40 x 10mm.
ESP59695	Equal in mass cylinders of diameter app.16Mm

Each cylinder adjusted to 100g. Cylinders vary in length from 5cm to 19cm to get the same mass and are drilled across cross- section near one end for suspension.

Metal Blocks - Pack of 12

Metal Blocks for use in density determinations. Set of twelve in assorted sizes, shapes and masses. The set comprises:2 x Brass , 2 x Iron , 2 x Aluminum , 2 x Copper ;2 x Zinc , 2 x Lead , Masses vary from 12 to 25g

ESP59696

Convection In Water Apparatus

For demonstrating the phenomenon of thermal convection in liquids caused by temperature variation. Consists of a rectangular-shaped borosilicate glass tube 18 MM with a funnel-shaped opening at the top for filling liquids. When tube is partially filled with water and heated at one corner after adding a dye, potassium permanganate crystals,

sawdust, or aluminium powder, the movement of colours or particles illustrates the formation of convection currents. Includes teacher's guide.

ESP59701

Convection In Air Apparatus

To show the convection of heat in air. Metal box, with sliding glass front and two detachable glass chimneys. Supplied without candles.

ESP59703

Metal Rivets

ESP59707	Iron, Pk of 500gm	**ESP59709**	Aluminium, Pk of 500gm
ESP59708	Copper, Pk of 500gm	**ESP59710**	Brass, Pk of 500gm

Lab Table Mobile

Table for laboratory and transport purposes; thanks to the large casters high door sills are no problem; thick plastic edges serve as protection against impacts. Plastic plates in green; 2 shelves for power supplies, measuring devices or small parts; bottom plate for experiment kits or larger items. Rack made of aluminium and silver-coated; shelves and bottom plate are easily removable, and can be taken apart and rearranged.
Working space : 750 x 500 mm
Shelf space: 750 x 244 mm and 750 x 123
mm Bottom plate : 750 x 385 mm
Total height : 900 mm
4 pulleys (D = 75 mm), two can be locked in position

ESP59715

Magnetic Base, D=43 Mm, With Tube And Pin

Rubber-encased metal base with embedded neodymium magnet; for fast assembly of round rods of Max. 10 mm in diameter; normal or parallel to a metal panel; rubber jacket prevents the table surface from scratches; this also makes the base non-slip; a newly-developed clamp set with a bearing pin enables elements to be fixed onto the plate surface at variable distances; holding force on bearing pin as a point of application; as measured parallel to the table:
Magnetic base D = 43 mm: 10 - 25 N | Magnetic base D = 66 mm: 20 - 70 N (The holding force is dependent on the strength (thickness) of the metal panel

ESP59720

Assembly For Lab Table

This assembly enables more elevated experimenting; this makes experiments easier for students to view.
Heavy power supplies or measuring devices can be placed beneath the experiment.
Two fixed special rail profiles allow fast, safe assembly of rail stand materials; can be placed on the instructor's table or portably on the lab table and fixed in position with screw clamps; cable holders are attached to the side.
Working space: 750 x 375 mm
Total height : 305 mm (excluding rail profile)

ESP59716

Panel, Green/White, 900X610mm

One side green, one side white,
Dimensions : approx. 90 x 62 cm

ESP59719

Screw Clamp, Jaw Width Approx. 50 mm

For mounting rails bases (special aluminium profile) or for assembly with a frame on tables with a maximum thickness of 48 mm;
Aluminium profile with steel pin, sturdy screw with M10 thread and pressure plate.

ESP59717

Board Holders, Pair, Magnetic

Board holders, pair, magnetic, L = 600 mm

ESP59718

Magnetic Base, D=66 Mm, With Tube And Pin

Rubber-encased metal base with embedded neodymium magnet; for fast assembly of round rods of max. 10 mm in diameter; normal or parallel to a metal panel; rubber jacket prevents the table surface from scratches; this also makes the base non-slip; a newly-developed clamp set with a bearing pin enables elements to be fixed onto the plate surface at variable distances; holding force on bearing pin as a point of application; as measured parallel to the table:
Magnetic base D = 43 mm: 10 -
25 N Magnetic base D = 66 mm:
20 - 70 N
(the holding force is dependent on the strength (thickness) of the metal panel

ESP59721

Claw Base Simple

Simple support base for quick set-ups; special aluminium profile (rail base profile); silver coated, with mounted rail claws; drill hole with screw for mounting rods of Max. D = 10 mm; surface
Dimensions : 265 x 220 mm

ESP59728

Claw Base, Magnetic

Simple magnetic support base for quick set-ups; special aluminium profile (rail base profile), with mounted rail claws including neodymium magnets; drill hole with screw for mounting round support material with a diameter of Max. 10 mm; surface
Dimensions : 265 x 220 mm

ESP59729

Rail Claw, Simple

Two rail claws attached to a special profile provide a support base or stabilise the track or optical bench; Fibre glass reinforced plastic with rubber feet;
Length = 220 mm

ESP59722

Rail Claw, Adjustable

Two rail claws attached to a special profile provide a support base or stabilise the track or optical bench;
Fibre glass reinforced plastic with rubber feet; with metal cylinders and levelling screws.
Length = 220 mm

ESP59723

Rail Claw, Magnetic

Two rail claws attached to a special profile provide a support base or stabilise the track or optical bench; Fibre glass reinforced plastic with rubber feet; with strong neodymium magnets (D = 22 mm, H = 10 mm); **Length** = 220 mm

ESP59724

Stand Rail Base

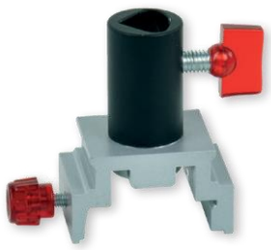
Special aluminium profile; silver-coated; creates a support base with two rail claws, or for holding universal rails using clamp saddles; hole on side for optional attachment to tables using the demo table clamp

ESP59725	L=125 Mm
ESP59726	L=250 Mm
ESP59727	L=500 Mm

Round Base With Stand Tube, Uni

or simple set-ups; heavy metal base with clamp socket for mounting round rods from D= 3mm up to D=14mm or square rods up to s= 12,5 mm; powder-coated; M8 fixing screw **Dimensions :** D= 84 mm, H= 58 mm
Weight : approx. 395 g

ESP59730



Sliding Saddle «Sepp», H = 40 Mm

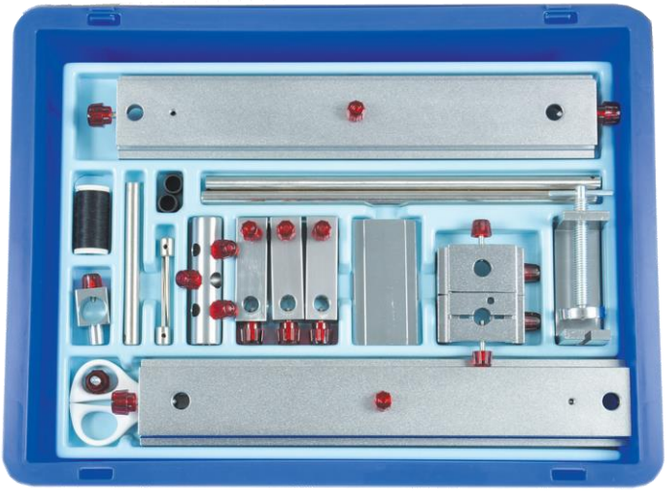
or a stable support of round or square rods on special aluminium profile, slide can be set at and moved to any position; special anodised aluminium profile with clamp socket, for supporting round rods of 3-14 mm in diameter or square rods of up to s = 12.5 mm; with M8 wing screw

ESP59731

Claw Base «Sepp», 260 X 220 Mm

Sturdy metal stand base with large surface area; special aluminium profile anodised with clamp socket, for stable support of round or square rods and for holding sliders; laterally positioned claws made of fibre glass reinforced plastic, with rubber pads; clamp socket for holding round rods of 3-14 mm in diameter or square rods of up to s= 12.5 mm; with M8 wing screw; surface area: 265 x 220 mm (583 cm^2); **Weight :** 383 g approx.

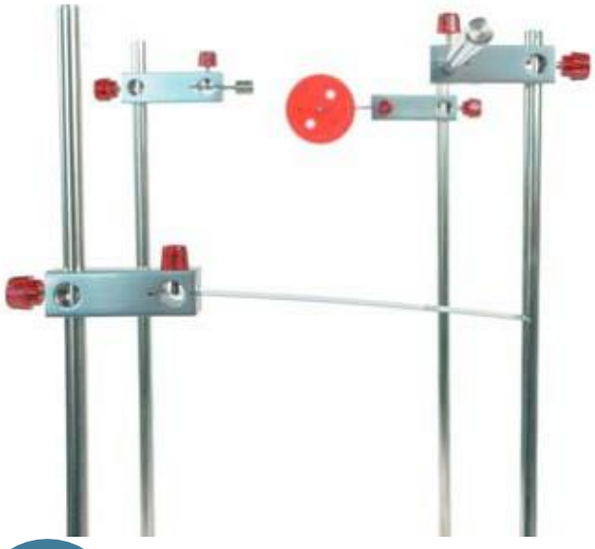
ESP59732



Stand Material Kit

Kit consisting of:
2x Bearing pin
1x Holder for dynamometer and test tubes, 1x Table clamp,
2x Stand rail, 300 mm,aluminium profile for use as stand base or inclined plane
1x Rail connector , universal Special aluminium profile, for connecting rails
3x Boss-head, universal,Rectangular aluminium profile, for mounting shafts, pins and / or springs
1x Boss-head, round,
1x Sliding saddle with set screw Special profile
1x Slider for pointers for heat expansion Special profile 2x Support rod, round, L = 250 mm, D = 10 mm
2x End cap for rods, plastics Creates a stand base out of a stand rail and a support rod
1x Support rod with pivot pin, L = 100 mm, D = 10 mm 1x Pair of scissors, SE
1x Cord, roll, 30 m, high tensile strength Storage:
1x Box insert Rail stand material
1x Storage box II small, with cover
Box insert plan with 2 labels

ESP59733



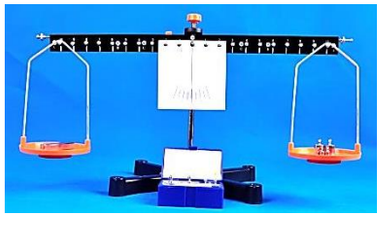
ESS MECHANIC 1 KIT

kit consist of :
(01) Support base, variable
(02) Steel pellets, d=2mm,150g
(03) Support rod, l=400mm,d=10mm
Support rod,l=412mm,d=10mm
Support rod,l=250mm,d=10mm
Support rod,l=300mm,d=6mm
(04) Beaker,250mL,Plastic
Beaker,100mL,Plastic
(05) Boss head
(06) Holding pin
Plate with scale
Pendulum
Fixed card
Lever fixing rod
Balance nut
Fixed block length
Fixed block short
Butterfly screw nut
Butterfly screw
S-hook
(07) Set of precision weights
(08) Slotted weight,10g*10
Slotted weight,50g*10
(09) Digital stop watch,24h,1/100s &1s
(10) Measuring tape,l=2m
(11) Fishing line,l=20m
(12) Spiral spring group,1N/2N/2.5N/3N/5N
(13) Graduated cylinder,50ml,transparent
Pipette with rubber bulb
Test tube,d =16 mm
(14) Pulleys,double in line,d=40mm/ 50mm
(15) Pulley,movable,d=40mm,with hook
(16) Pulley,movable,d=50mm,with hook
(17) Vernier caliper,metal
(18) Spring balance,transparent,1 N
(19) Electronic balance
Balance bracket
(20) lever
Spring balance,transparent,2.5N
(21) Balance pan, plastic

ESP59736

List of Experiments

1. Mechanical movement
1.1 Measuring the length with a scale
1.2 Measuring time with stopwatch
2.Quality and Density.
2.1 Determination of the volume of regular bodies and irregular bodies
2.1 Determination of solid density
2.2 Determination of liquid density
3. Force 14 3.1 Practice using a spring dynamometer
3.2 Exploring the relationship between gravity and mass
4.Exercise and strength 18 4.1 The role of force and force
4.2 Forces acting on the same line
4.3 Measuring the buoyancy of an object immersed in water
4.4 Measuring buoyancy to determine solid density
5.Simple Machinery
5.1 Exploring the balance of leverage
5.2 Leverage balance 30 5.3 single side lever



NEW

Mechanics Equipment Kit

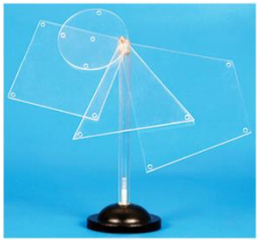
81 Pieces Student Experiments could include: Newton's Laws, Force, Momentum, Collisions, Simple Machines, Equilibrium, Measurement, Constant Motion, Velocity, Acceleration,
Gravitational Constant, Inertia, Energy Transfer
Kits include 2 Large plastic containers with tops to keep all pieces organized and safe.
Endless Topics can be taught, great equipment kit to outfit a new physics classroom or boast an old one

ESP59741

Basic Dynamic System Set

Economical way to teach dynamics including, but not limited to, position, velocity, acceleration, force, elastic and in elastic collisions, momentum, conservation of energy, and much more. If you are looking to get started teaching physics, or need to revamp your mechanics labs this is the perfect kit. The kits contains 1 - 1.2m Track with pulley, 1 - Trolley Standard, 1 - Trolley Spring loaded, 2 - Masses, 10 x 10 g Masses, 1 - Ticker tape timer, 5 - Spare tapes, 1 - Pack of carbon discs, 1 - Reel of cotton, 1 - Spirit level 1 - Stopwatch

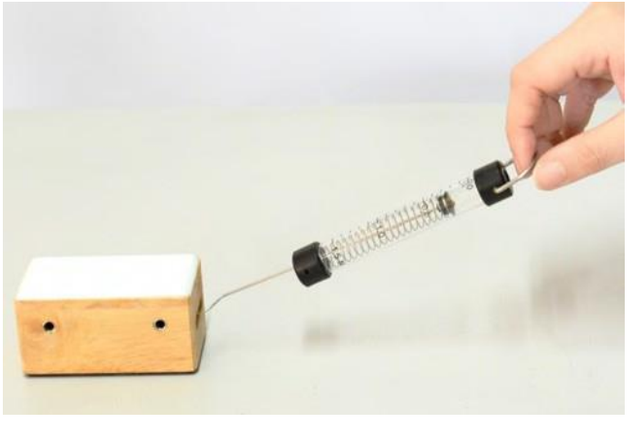
ESP59744

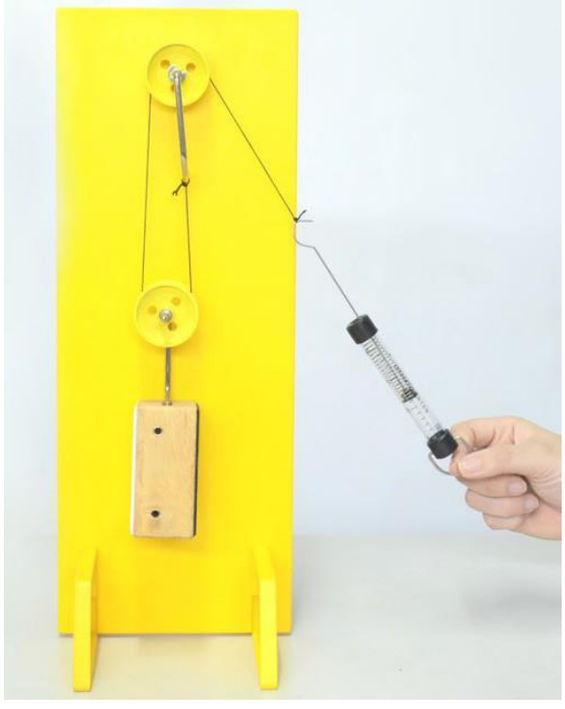


Center of Gravity

A simple and economical apparatus for demonstration of geometrical center of gravity of two-dimensional objects. Center of gravity of a freely suspended two dimensional object always lies along the line drawn vertically downward from its point of suspension.Comprises a clear perspex rod mounted on a base with a suspension screw at the top and four laminas of clear acrylic.One each of circular, triangular, square and trapezoidal. Each lamina has suspension holes along their periphery. The point of intersection of lines drawn from point of suspension of 2 or more holes of a lamina gives center of gravity of that 2-dimensional lamina

ESP59751





Simple Machines Kit

Ideal for use by Primary School students. The student will understand the basic concepts of friction between different surfaces, the concept of lever and pulley system. Using this kit the student will be able to design their own experiments.

Experiment topics:

Friction between different surfaces. Function of an inclined plane.

Function of pulley system. Characteristic of a lever.

Specification:

The kit consists of : 1 friction block , 4 pulley wheels , 2 hooks, 1 rider), 1 spring balance , 1 lever , 1 hook with spring hull and 1 axlel.

Dimensions : (L) 32.00 x (W) 8.00 x (H) 5.00cm

Weight : 0.285kg

ESP59735

Junior High School

Senior High School

Mechanic Kit 1

ESP59737

- The guide book consists of 31 experiments.
- The experiments are related to the basic principle of measurement,
- density measurement, simple device (lever, pulley and inclined plane), moving object, waves, sound, and solar system.

Component List

Consists of 37 components, packed in a plastic injection
Dimensions: 61 x 26 x 17 cm. Weight: 5 kg.

Cat. code	Component	Qty	Cat. code	Component	Qty
ESP 180	Stand Base with 3 Clamps	2 pcs	ESP 139	Load Hook	2 pcs
ESP 51.02/02	Stand Foot	2 pcs	ESP00280	Plastic Pulley Ø 50 mm, Yellow	1 pc
ESP 51.05/05	Support Block	2 pcs	ESP00281	Plastic Pulley Ø 100 mm, Red	2 pcs
ESP 30/250	Stand Rod Ø 10 x 250 mm	2 pcs	ESP 51.20/31	Plastic Lever	1 pc
ESP 30/500	Stand Rod Ø 10 x 500 mm	2 pcs	ESP 203	Coupling Rod	2 pcs
ESP 174	Rod Coupling	1 pc	ESP 162	Inclined Plane, 2 Measuring Scale	2 pcs
ESP 15/305	Steel Ruler 50 cm	1 pc	ESP 51.26/39	Helical Spring 0.1 N/cm	1 pc
ESP 51.08/08	Pointer	1 pc	ESP 325 03	Friction Block	1 pc
ESP 51.08/09	Nylon Thread	1 pair	ESP 213	Cubes of Matter (6 pcs)	1 pc
ESP 51.09/10	Load 50 gr	1 roll	ESL57745	Analog Stopwatch	1 set
ESP 125 01	Load 25 gr	6 pcs	ESP 320	Stepped Block	1 pc
ESP 51.10/11	Dynamometer 3.0 N	6 pcs	ESP 228	Trolley, Plastic	1 pc
ESP 45	Vernier Caliper	2 pcs	ESP 227	Trolley with Motor, Plastic	1 pc
ESP 51.13/16	Aluminum Block	1 pc	ESP 51.07/07	Dynamometer 1.5 N	1 pc
ESP 51.14/23	Holding Clamp	1 pc	ESP59810	Ticker Timer with Clamp Rider +	1 set
ESP 361	Axle with Plug	3 pcs		Paper Tape (length 150 m)	

ESP59737

Supporting Components

Available in Hydrostatics and Heat Kit .

Cat. code	Component	Qty
ESP60132	Overflow Vessel	1 pc
ESL56548	Beaker 250 ml	1 pc
ESL56519	Measuring Cylinder 100 ml, Plastic	1 pc
ESP 11.17	Marble	2 pcs

Available in Optics Kit ESP60392.

Cat. code	Component	Qty
ESP 16.01/65	Optic Table	1 pc
ESP 16.02/66	Precision Rail 50 cm	2 pcs
ESP 16.03/67	Rail Connector	2 pcs
ESP 16.04/68	Foot for Rail	2 pcs
ESP 16.17/87	Clamp Rider	1 pc

Available in Electricity & Magnet Kit ESP59115

Cat. code	Component	Qty
ESL57914	Connecting Lead DC 50 cm, Red	1 pc
ESL57915	Connecting Lead DC 50 cm, Black	1 pc

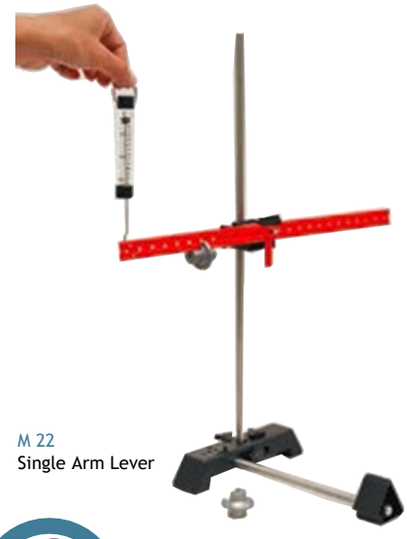
Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. code	Tool	Qty
ESP 23	Balance 311 g	1 set
ESP60751	Power Supply	1 pc
ESP60308	Slinky Ø 80 mm	1 pc
ESP60351	Tuning Fork on Resonance Box	1 pc

Experiment Topics

M 1	Measurement of Length
M 2	Measurement of Diameter
M 3	Measurement of Area
M 4	Measuring Volume of Regular Shaped Solid
M 5	Measuring Volume of Irregular Shaped Solid
M 6	Measuring Mass
M 7	Measurement of Time
M 8	Measuring Specific Mass: Regular shaped solid
M 9	Measuring Specific Mass: Irregular shaped solid
M 10	Measuring Specific Mass: Liquid
M 11	Average Velocity
M 12	Uniform Linear Motion
M 13	Average Acceleration
M 14	Uniform Accelerated Motion
M 15	Free Fall
M 16	Measurement of Force
M 17	Addition of Force Vectors
M 18	Friction Force
M 19	Newton's First Law of Motion
M 20	Newton's Second Law of Motion
M 21	Two Arm Lever
M 22	Single Arm Lever
M 23	Fixed Pulley
M 24	Moving pulley
M 25	Fixed and Moving Pulley
M 26	Pulley System
M 27	Inclined Plane
M 28	Simple Harmonic Motion is a Spring
M 29	Simple Pendulum
M 30	Mechanical Transversal Wave
M 31	Mechanical Longitudinal Wave



M 22
Single Arm Lever

M 26
Pulley System

M 27
Inclined Plane

ESP59737

Junior High School

Senior High School

Mechanic 2 Experiment Kit

ESP59738

The Cart and Ticker-Timer Experiment Kit is designed to observe a few types of linear motion. The ticker-timer that ticks a carbon mark from a carbon paper to the paper ribbon with a certain frequency can acquire the position of a cart or any object that moves along a straight line as a function of time. This acquired data can be used to observe uniform linear motion and accelerated linear motion.

Component List Consisting of 8 components, packed in a plastic injection molding box. Dimension: 62 × 30 × 9 cm. Weight: 3.4 kg.

Cat. code	Component	Description	Qty
ESP 16.02/66	Precision Rail 100 cm	For use in mechanics experiments as track for Trolley / trolley with motor.	2 pcs
ESP 16.03/67	Rail Connector	Used for rigid straight coupling of two Precision Rail.	1 pc
ESP 228	Dynamic Cart	Design for experiments in kinematics and dynamics. Low wheel friction and small moment of inertia. Extended plates protect the wheels and prevent trolley from rolling of the rail. Complete with holding clip for recording tape, socket for additional weight and socket for attaching spring and buffer for collision experiments.	1 pc
ESP59825	Motorized Cart	Trolley with DC motor designed for mechanical experiment, especially for linear motion. Have a clip mounted on trolley body to hold end of ticker tape. Can be run on precision rail with two kind of velocity.	1 pc
ESP59810	Ticker Timer, AC socket	For recording one dimensional motions (type motion, speed, acceleration) of a trolley or falling weight by analyzing ticks on 9.5 mm ticker tape which are produce at fixed frequency together with motion of the objects.	1 pc
ESP 69/02	Paper Ribbon for Ticker timer	Used to time record the motion of dynamic cart, using ticker-timer.	1 pc
ESP 16.04/68	Rail Footing	For height adjustment of the Precision Rail when connected.	2 pcs
ESP 51.37/72	Stepped Block	For raising one end of a Precision Rail in increments.	1 pc

Experiment Topics

E1	Ticker-Timer
E2	Instantaneous Speed and Instantaneous
E3	Acceleration Uniform Linear Motion
E4	Accelerated Linear Motion

Supporting Components

For detailed information, please refer to page 70 - 73.

Cat. code	Component	Qty
ESP60751	Power Supply AC/DC, 50 HZ	1 pc

Junior High School

Mechanics Kit 3
ESP59739

Component List

Consists of 36 components, packed in a plastic injection molding box.
Dimensions: 61 × 44 × 16 cm. Weight: 8.5 kg.

Cat. code	Component	Qty	Cat. code	Component	Qty
ESP 180	Stand Base with 3 Clamps	1 pc	ESP 51.37/72	Stepped Block	1 pc
ESP 185	Table Clamp	1 pc	ESP 160	Flat Spring Set	1 set
ESP 16.17/87	Clamp Rider	2 pcs	ESP 160 03	Threaded Rod with Butterfly Nut	1 pc
ESP 16.03/67	Rail Connector	1 pc	ESP 100	Helical Spring, 4.5 N/m	1 pc
ESP 16.04/68	Foot for Rail	2 pcs	ESP 51.26/39	Helical Spring, 10 N/m	1 pc
ESP 30/250	Stand Rod, 250 mm	2 pcs	ESP 51.27/40	Helical Spring, 25 N/m	1 pc
ESP 30/500	Stand Rod, 500 mm	1 pc	ESP 27.01	Slotted Load and Hanger 250 g (6 loads, 1 set 1 hanger)	1 set
ESP 162	Bosshead, Universal	2 pcs	ESP60299	Vibration Generator	1 pc
ESP 161	Bosshead, Round	1 pc	ESP 160 02	Holder for Pencil	1 pc
ESP 201	Bearing Pin	2 pcs	ESP 221	Roll Meter, 3 m	1 pc
ESP 51.02/02	Stand Foot	2 pcs	ESP 010	Rubber String	1 pc
ESP 30/010	Rod, 100 × 10 mm	1 pc	ESP 69	Paper Tape for Ticker Timer, Ø 49 mm	1 pc
ESP 51.08/09	Nylon Cord	1 roll	ESP59810	Ticker Timer with Clamp Rider	1 pc
ESP 011	Scissors	1 pcs	ESP 202	Flat Spring for Explosion Experiment	1 pc
ESP 16.02/66	Precision Rail, 50 cm	2 pcs	ESP 186	Pulley for Table Clamp	1 pc
ESP 200	Spring on Buffer for Trolley	2 pcs	ESP 51.37/72	Stepped Block	1 pc

Supporting Components

Available in Hydrostatics and Heat Kit .

Cat. code	Component	Qty
ESP59825	Overflow Vessel	1 pc
ESP 15/105	Ruler, 500 mm, Wood	2 pc
ESP 16 0 01	Ball for Pendulum, 35 g	1 pc
ESP 11.17	Marble	1 pcs
ESP 160 02	Ball for Pendulum, 70 g	1 pcs

For detailed information, please refer to page 70 - 73

Cat. code	Component	Qty
ESL57745	Analog Stopwatch	1 pc
ESP 26	Balance 2610 g	1 pcs
ESP60750	Power Supply, 5 A, 12 V	1 pcs
ESP60296	Audio Frequency Generator	1 pc

Experiment Topics

Kinematics And Dynamics	
MU 01	The Ticker Timer
MU 02	Motion of a Trolley on a Horizontal Plane (Rail)
MU 03	Uniform Motion
MU 04	Average and Instantaneous Velocity
MU 05	Motion of a Trolley on an Inclined Rail
MU 06	Free Fall
MU 07	Newton's Law
MU 08	Collision, Linear Momentum
MU 09	Explosion
MU 10	Conservation of Mechanical Energy
Vibrations	
MU 11	Simple Pendulum
MU 12	Oscillation of a Mass Suspended by a Spring
MU 13	Oscillation of a Flat Spring Loaded with Mass at its End
MU 14	Oscillation Chart
MU 15	Acceleration Due to Gravity
MU 16	Resonance of a Simple Pendulum
MU 17	Resonance of a Spring with Mass Suspended
MU 18	Hooke's Law
Mechanical Waves	
MU 19	Propagation and Reflection of Transversal Wave
MU 20	Transversal Standing Wave in a String (Cord)
MU 21	Longitudinal Standing Wave in Helical Spring

MU 08 Collision, Linear Momentum

MU 09 Explosion

MU 06 Free Fall

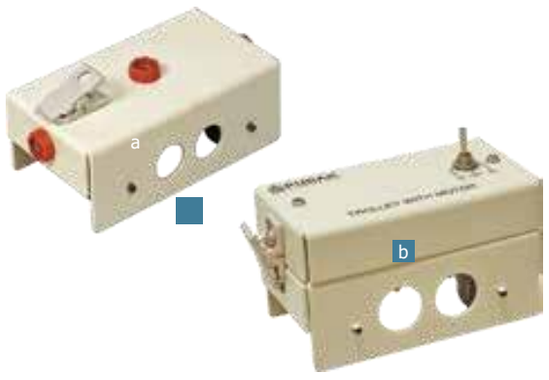
MU 18 Hooke's Law

MU 14 Oscillation Chart

MU 20 Transversal Standing Wave in a String (Cord)

Component Detail

ESP59825
Dynamic Cart



a. Dynamic cart (PSP59825) has low friction and moment of inertia wheels. A ticker timer paper clip is mounted on top of the cart. Buses are also provided to mount additional tools such as ESP 200 and ESP 201

b. Motored dynamic cart (ESP59825) is use for linear motion experiment on the precision rail; two speeds switch; operated with two AA size batteries.

Precision Rail and Connector

c. Precision rail (ESP16.02/66) is made of anodized aluminum extrusion; completed with milimeter and centimeter ruler on both sides.

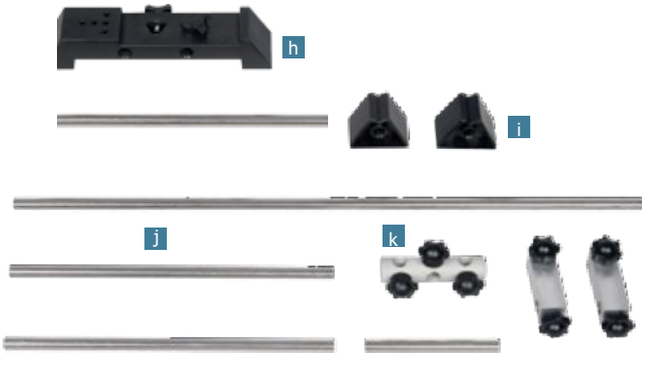
d. Rail connector (ESP 16.03/67) is used to connect two rails rigidly in straight position; 20 cm long; made of ABS plastic.

e. Stepped block (ESP 51.37/72) is used to raise one of precision rail ends. It is used in the accelerated motion and friction compensation between wheel and rail experiment; made of ABS plastic.

f. Rail foot (ESP 16.04/68) is mounted on the connecting precision rails; made of ABS plastic.

g. Clamp rider (ESP 16.17/87) is made of ABS plastic. It is used as a movable self-clamping component holder on the rail precision. To loosen and move the clamp, press the two levers on the side.

Stand Base System



h. Stand base (ESP 180), which is made of ABS plastic, is a multi purpose component. The main hole in the middle is use to hold the stand rod vertically. 5 vertical 4 mm holes are used to plug other component. 2 horizontal holes are used to hold stand rod horizontally. The bottom part is layered by rubber sheet.

i. Stand foot (ESP 51.02/02) is used together with stand base and stand rod to build a rigid and stable stand. Triangular shaped is made of ABS plastic.

j. Stand rod, made of stainless steel with 10 mm diameter and the length of 100 mm (KST 30/010), 250 mm (ESP 30/250), and 500 mm (ESP 30/500).

k. Aluminum cylindrical bosshead (ESP 161).

l. Aluminum universal bosshead (ESP 162).

ESP60299
Vibration Generator

This apparatus produces mechanical wave with the help of Audio Frequency Generator (ESP60296); input through 4 mm socket; 6 mm amplitude.

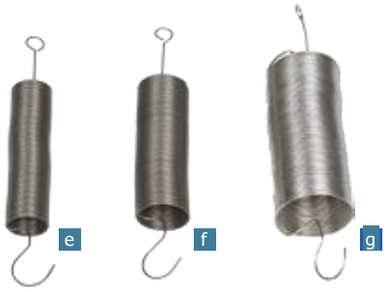
Spring and Accessories

a. Flat spring with clamp (ESP 160): steel spring, length 300 mm, equipped with a clamp.
b. Screwed rod with nut (ESP 160 03): 60 mm long, 4 mm diameter.
c. The Pencil Holder (ESP 160 02) is a special designed pencil holder completed with helical spring to push the pencil towards the paper.
d. Slotted mass with hanger, 250 g total weight (FME 27.00), consisting of 3 × 50 g, 2 × 20 g, 1 × 10 g and 1 × 50 g, made of nickel plated brass.

Helical Spring

Steel helical spring with hook and ring ends, which is used for Hooke and oscillation experiments.

a. Helical spring, 25 N/m (ESP 51.27/40).
b. Helical spring, 10 N/m (ESP 51.26/39).
c. Helical spring, 4.5 N/m (ESP 100).

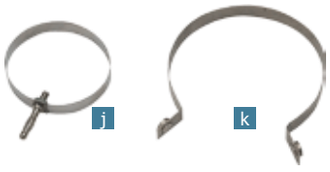


Pendulum

h. 35 g brass pendulum (ESP 160 01).
i. 75 g brass pendulum (ESP 160 02).

Accessories for Momentum Experiment

j. Steel crusher spring (ESP 200).
k. Steel spring for explosion model (ESP 202).



Ticker Timer and Paper Tape

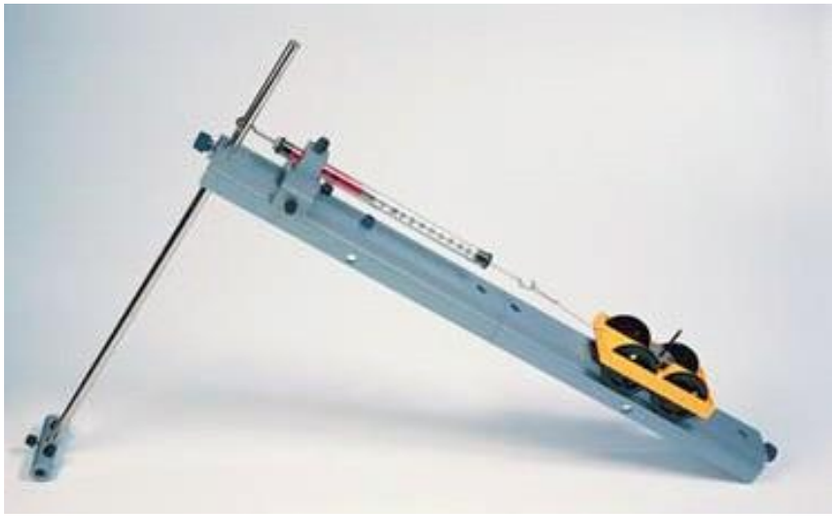
l. Ticker Timer (ESP59810) is used to find out the type of motion, measuring the motion rate, and the velocity by analyzing dots produced by the fix frequency ticker. The dots are printed on the paper tape that moves together with the Dynamic Cart (ESP 51.34/69) or free falling object. Ticker Timer is completed with clamp rider that can be clamped to the precision rail (ESP 16.02/66).
m. Ticker timer tape paper (ESP 69), 9.5 mm width.

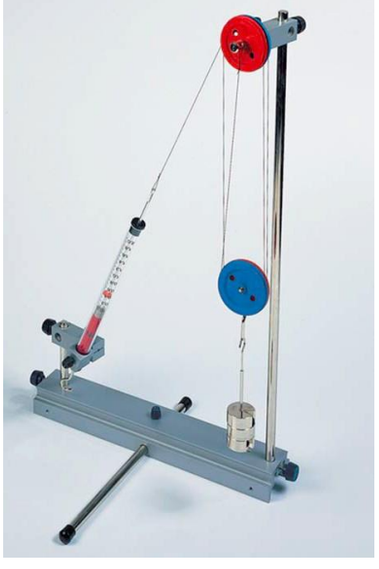
Measuring and General Tools

n. Stainless steel scissors (ESP 011).
o. Rubber thread (ESP 010): cotton and rubber, 3 m long.
p. Nylon cord (ESP 51.08): twisted nylon, 1 mm diameter, 10 m long, max load 2.5 kg.
q. 500 mm wooden ruler (ESP 15/105), with centimeter and milimeter units.
r. Pulley (ESP 168): 50 mm plastic pulley with metal frame, for desk clamp mounting.
s. Table clamp (ESP 185).
t. Measuring tape, 3 m (ESP 211), plastic housing.
u. Bearing pin (PESP 201), nickel plated brass.

Mechanic Kit For Grade 6-9

Kit consisting of:
1x Dynamics trolley
1x Measuring tape, L=300 cm
2x Scale pan with suspension
1x Pointer for lever rod
1x Scale with graduation
1x Sliding saddle for lever rod
1x Lead (tare) shot, 50 g
1x Vernier calliper, plastic
1x Beaker plastics, 100 ml
1x Graduated cylinder plastics, 100 ml 1x Immersion probes, set of, SE
2x Manometer-tube, acrylic, D=8 mm, L=200 mm 1x Acrylic tube, D=20 mm, L=120 mm
1x Stopper silicone, 12.5/18/27 mm, 1 hole 1x Test tube glass 12×100 mm
4x Slotted weight, 50 g
4x Slotted weight, 10 g
2x Holder for slotted weights, 10g
1x Balance weights set, 1…50 g
2x Support rod, round, L=500 mm, D=10 mm
1x Acrylic tube, D=8 mm, L=80 mm
1x Hollow block (Archimedes)
1x Aluminium block
1x Block iron with hook, big 1x Block iron with hook, small
1x Coil spring 3 N/m, D=35 mm approx.
1x Coil spring 20 N/m, D=12 mm approx.
1x Lever rod for balance SE, L=420 mm
1x Flat spring steel, 0.4mm, L=165 mm
1x Capillary tubes, set of 3
1x Pulleys, set of (4 pieces), plastics
1x Tubing plastics, 100 cm, transparent 1x Tubing plastics, 16 cm, transparent 2x Dynamometer 2 N, transparent **Storage**:
1x Box-insert Mechanics 1, SE 1x Storage box II big, with cover
Box -insert plan with 2 labels





ESP59742

Dynamic Kit

Kit consisting of:
2x Dynamics trolley
4x Slotted weight, 50 g 3x
Slotted weight, 10 g
1x Holder for slotted weights, 10g, 2x
Spring bumper
1x Pulley with very low friction 2x
Car body for trolley
1x Flat spring for collision experiments with trolleys 1x
Support rod, round, L=60 mm, D=10 mm
1x Measuring tape, L=300 cm 1x
Trolley with variable speed 1x
Track and optical bench,
2 x 50 cm, alu rail profile, anodized, 1x
Rail bond , universal

Storage:
1x Box-insert Dynamics
1x Plastic box II big, with cover, Box -
insert plan with 2 labels.

ESP59743

Senior High School
Junior High School

Mechanics Kit Panel Type
ESP59745

- Quick and easy to assemble with magnetic mounting system.
- Comprehensive – from vector to balance concept, and simple devices.
- 14 static mechanics experiments are designed for students in order to understand the following concepts easier:
  - Force
  - Object balance
  - Torque moment and its application
  - Simple machine
  - Simple harmonic motion
  - and inclined plane), moving object, waves, sound, and solar system.

Component List

Consisting of 18 components, packed in a plastic injection molding box.
Dimension: 66 × 62 × 15 cm. Weight: 12 kg.

Cat. code	Component	Description	Qty
a ESP 360. 01	Experiment Board	Dual face; one with white painted metal surface and the other is functioned as a white board; the experiment board is mounted on experiment board's legs (PMK 360 13).	1 pc
b ESP 360. 02	Dynamometer 5 N	Graduation: 0 - 5 N x 0.1 N and 0 - 500 g, mounted on magnetic holder.	1 pc
c ESP 360. 09	Rolling Load	Rolling mass is mounted on a hooked frame. It is used to understand the object working force and normal force.	1 pc
d ESP 360. 07	Inclined Plane with Plumb Bob	Equipped with degree graduation and a plum-bob to indicate the plane obliqueness. It has magnetic holder	1 pc
e ESP 360. 06	Disc with Degree Scale	It is used as an angle measuring tool and as a reference of a ring-shaped object position. It has magnetic holder.	1 pc
f ESP 360. 08	Torque Wheel	A disc with 3 blades and millimeter circular graduation, equipped with ball bearing and magnetic holder. It is used to simplify the understanding of force moment concept (torque) on an equilibrium.	1 pc
g ESP 41/02	Pulley Block	40 and 60 mm diameter pulleys are mounted on a frame. It is used to understand the simple device on pulley system.	1 pc
H ESP 360. 11	Pulley 40 mm	40 mm pulley with magnet, it is used in force, force equilibrium, and simple device experiment.	2 pcs
i ESP 360. 12	Pulley 60 mm	60 mm pulley with magnet, it is used in force, force equilibrium, and simple device experiment.	1 pc
j ESP 360. 10	Plannar Object	An irregular pentagonal object which is used to understand the object's center of mass concept.	1 pc

Cat. code	Component	Description	Qty
j ESP 360. 10	Plannar Object	An irregular pentagonal object which is used to understand the object's center of mass concept.	1 pc
k ESP 325 01	Friction Block	A block with 4 different surfaces, rubber, wood, plastic and glass. Detachable hook.	1 pc
l ESP 27.01	Slotted Load and Hanger 250 g (6 loads, 1 hanger)	Loads with gaps and nickel plated brass hanger.	2 sets
m ESP 26.01	Slotted Load and Hanger 150 g	(2 loads, 1 hanger)	1 set
n ESP 51.26/39	Helical Spring	One end is ring shaped and the other end is hook shaped, material is spring steel.	1 pc
o ESP 51.08/09	Cord on Reel	Nylon twisted thread on plastic reel.	1 pc
p ESP 360. 04	Pivot Mount	Function as pivoting axle or fulcrum for the Lever Beam; with magnetic base.	1 pc
q ESP 360. 03	Lever Beam	Alumunium lever beam to function as object acted on by forces and as a lever. It is included	1 pc
s ESP 360. 05	Ring	A ring functions as an object on to which forces are applied.	3 pcs
t ESP 15/305	Steel Ruler 50 cm	Made of stainless steel; length 50 cm. Scale with centimeter and millimeter unit.	1 pc
s ESP 360. 05	Ring	A ring functions as an object on to which forces are applied.	3 pcs

Magnetic Mounting System

The dimension of the experiment panel board is 600 × 600 mm, large enough space for experiment. Components are equipped with neodymium magnet, so they can be placed onto the experiment board. This system makes component positioning easier.

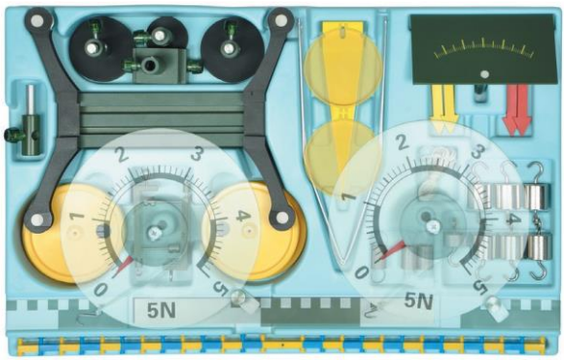
Experiment Topics

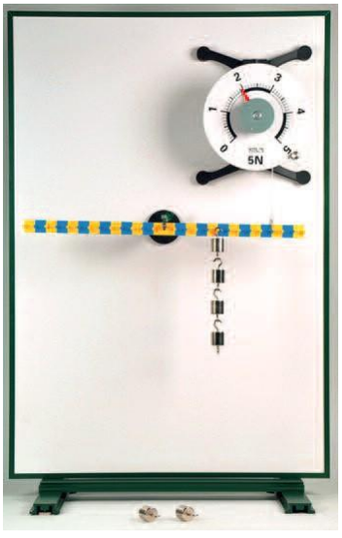
Experiment 01 Hook's Law and the Measurement of Force Equilibrant and Resultant Forces
Experiment 02 Resolving a Force
Experiment 03 Torques for Parallel Forces
Experiment 04 Torques for Non-Parallel Forces (Part 1) Torques for Non-Parallel Forces (Part 2) Center of Gravity and Center of Mass Equilibrium of Extended Body
Experiment 05 Simple Machines: The Inclined Plane Simple Machines: The Lever
Experiment 06 Simple Machines: The Pulley Sliding Friction
Experiment 07 Simple Harmonic Motion: Oscillation of Mass Hanging on a Spring Simple Harmonic Motion: The Simple Pendulum
Experiment 08
Experiment 09
Experiment 10
Experiment 11
Experiment 12
Experiment 13
Experiment 14

Experiment 06
Torques for Non-Parallel Forces (Part 2)

Experiment 09
Simple Machines: The Inclined Plane

ESP59745





Demo Mechanic Kit 1

Consist of:
1x law base, magnetic, L = 200 mm
2x Magnetic base, D = 66 mm, with tube and pin
1x Magnetic base, D = 43 mm, with tube and pin
1x Sliding saddle, H = 34 mm
1x Stand tube, H = 40 mm
2x Torsion dynamometer 5 N
6x Weight on hook, 100 g, unpainted
1x Weight on hook, 20 g, unpainted
1x Coil spring, 10 N
2x Coil spring, 5 N / m, D = approx. 16 mm
1x Flat spring steel, 0.6 mm, L = 300 mm
1x Lever rod demo, L = 520 mm
1x Pointer for lever 520, metal
1x Scale on support
2x Scale pan with handle, Demo
4x Pulley, plastic, D = 100 mm
2x Bracket for pulleys D = 100 mm
1x Cord, white, L = 5 m
1x Measuring tape with scale in blocks, magnetic
2x Pointer, red, magnetic
2x Pointer, yellow, magnetic

Storage:
1x Box insert Static Mechanics 1
1x Storage box II big, with cover

ESP59747

Demo Mechanic Kit 2

consisting of:
1x Plate for testing centre of gravity
1x Plumb line
1x Inclined plane, simple (02)
1x Holder for torsion dynamometer for inclined plane
1x Ring for force table
1x Rubber band, wide
1x Roller
1x Friction block, multifunctional
1x Wheel and axle, demo
1x Crank pin, L = 50 mm
1x Drive belts, set of 2
1x Gear with 20 teeth, red
1x Gear with 40 teeth, yellow
1x Gear with 60 teeth, green
1x Pair of scissors, SE
1x Dynamics trolley, demo, 50 g
1x Belt pulley D = 100 mm, yellow

Storage:
1x Box insert Static Mechanics 2
1x Storage box II big, with cover.

ESP59748

Predicting Trajectories

Students explore the vertical and horizontal components of projectile motion in this laboratory investigation using ramps, time trials, and a three man slingshot. Topics include trajectory motion, acceleration due to gravity, speed, and velocity. Includes guided calculations and encourages the use of calculation to predict apex and landing. After learning the basic concepts, students go outside and collect data using water balloons and a three man sling shot! Includes instructor's manual, student worksheets, ramps, ball bearings, stopwatches, metric tapes, paper cups, string, washers, three man slingshot, and water balloons. Appropriate for any level physics course (including AP) as well as general science courses. Designed for working in groups of four to six, with materials sufficient for up to 36 students. Meets national standards for grades 9-12.

ESP59750

Circular Motion

A simple experiment for studying centripetal force. Topics also include tangential motion and centripetal acceleration. Students record real data to calculate real forces. Includes instructor's manual, guided calculations and assessment questions, sample data, complete answer keys, and materials for all experiments. Also includes a teacher demonstration. Required, but not included: balance or scale accurate to .01 g. Appropriate for any level physics course (including AP) as well as general science courses. Designed for working in groups of four to six, with materials sufficient for up to 36 students. Meets national standards for grades 9-12.

ESP59753

Simple Pendulum

Students use simple pendulums to accurately determine the passage of time. Real data is recorded as students determine the effects of independent variables on periodicity while also learning about kinetic and potential energy. Includes instructor's manual, reproducible stepwise instructions for students, guided calculations, assessment questions, sample data, complete answer keys, and all materials for activities. Required, but not included: balance or scale accurate to .01
g. Appropriate for any level physics course (including AP) as well as general science courses. Designed for working in groups of four to six, with materials sufficient for up to 36 students. Meets national standards for grades 9-12..

ESP59757

Simple Pendulum Experiment Kit

Consist of :
Stand Base and Rod, Steel plate 1 pc Boss-head, Universal 1 pc
Bearing Pin 1 pc Nylon Thread 1 pc Digital Stopwatch 1 pc
Ball for Pendulum 35 g 1 pc Ball for Pendulum 70 g 1 pc Ball for Pendulum 105 g 1 pc
Dimensions :
(L) 62.00 x (W) 30.00 x (H) 9.00 cm
Weight : 3.300 kg.

ESP59756

ESP59756

Senior High School
Junior High School

Simple Pendulum Experiment Kit
ESP59756SP

- Simple pendulum is one of the simplest method of measuring the magnitude of gravity's acceleration. Theoretically, the oscillation period of a small angular displacement pendulum has a mathematical correlation between the magnitude of gravity's acceleration and the length of the pendulum's string.
- In this experiment, the measurement of the oscillation period and the length of the string is conducted by using stopwatch and a ruler respectively.
- This kit also include a few bobs with different masses. Using different bobs, user will also be able to prove that the magnitude of the bob's mass does not affect the pendulum's oscillation period.

ESP59756SP

Component List

Consisting of 10 components, packed in a plastic injection moulding box. Dimension: 62 × 30× 9 cm. Weight: 3.1 kg.

Cat. code	Component	Description	Qty
ESP 25/30	Stand Base 190 mm, A-Shaped	Die cast iron, equipped with locking bolt.	1 pc
ESP 30/500	Stand Rod Ø 10 x 500 mm, Stainless Steel	Stainless steel, Ø 10 mm, length 500 mm.	2 pcs
ESP 00023	Bosshead, Universal	Can be used to connect two stand rods by axial and perpendicular. Used to clamp circular stand rod.	1 pc
ESP 206	Bearing Pin		1 pc
ESP 174	Rod Coupler	Rod Coupling is used as Stand rod connector with clipped way. Material: Plastic injection	1 pc
ESP 137	Slotted Masses and Hanger 100 g (3 Loads)	Consists of 3 loads each with a mass of 100 g.	1 set
ESP 00222	Digital Stopwatch	Digital Stopwatch with accuracy of 0.01 seconds	1 pc
ESP 51.26/39	Helical Spring 10 N/m	Has a spring constant of 10 N / m with a diameter of 1 mm. Steel material.	1 pc

Experiment Topics

E1 Swinging Pendulum

E2 Determining Earth's Gravitational Acceleration Using a Simple Pendulum

Junior High School

Senior High School

NEW

Oscillating Spring Experiment Kit
ESP60322

The Oscillating Spring Experiment Kit is designed to evaluate factors that affect the oscillation period of a spring system. Theoretically, the oscillation period of a spring system has a mathematical correlation between the magnitude of the load mass and the spring constant. Interestingly, the displacement of the spring does not affect the oscillation period. By varying these magnitudes while measuring the oscillation period using stopwatch, the theoretical model can be tangibly observed.

Component List

Consisting of 10 components, packed in a plastic injection moulding box. Dimension: 62 × 30× 9 cm. Weight: 3.1 kg.

Cat. code	Component	Description	Qty
ESP 25/30	Stand Base 190 mm, A-Shaped	Die cast iron, equipped with locking bolt.	1 pc
ESP 30/500	Stand Rod Ø 10 x 500 mm, Stainless Steel	Stainless steel, Ø 10 mm, length 500 mm.	2 pcs
ESP 00023	Bosshead, Universal	Can be used to connect two stand rods by axial and perpendicular. Used to clamp circular stand rod.	1 pc
ESP 206	Bearing Pin		1 pc
ESP 174	Rod Coupler	Rod Coupling is used as Stand rod connector with clipped way. Material: Plastic injection	1 pc
ESP 137	Slotted Masses and Hanger 100 g (3 Loads)	Consists of 3 loads each with a mass of 100 g.	1 set
ESP 00222	Digital Stopwatch	Digital Stopwatch with accuracy of 0.01 seconds	1 pc
ESP 51.26/39	Helical Spring 10 N/m	Has a spring constant of 10 N / m with a diameter of 1 mm. Steel material.	1 pc

Experiment Topics

E1 Swinging Pendulum

Reversible Pendulum
ESP60648

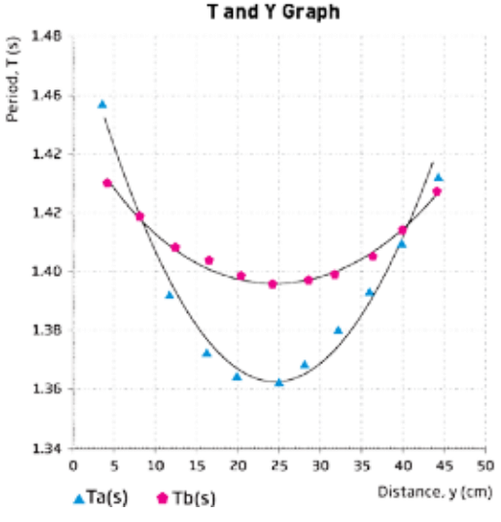
- Reversible pendulum is a physical pendulum which has a pair of pivot points in a fix distance. Pendulum's oscillation interval can be adjusted, therefore the interval on each pivot point is equal or nearly the same.
- The pivot point is in the form of a blade, made of hard steel, and the position can be arranged as necessary. The pendulum is supplied with 2 bobs, one is functioning as a bob in fix position and the other can be shifted along the pendulum rod.
- In the experiment, the 'fix bob' position is un- changed, while the 'un-fix bob' is shifted to gain the same or nearly the same oscillation interval on both pivot points.
- Time measurement can be done manually by using a stopwatch or for better accuracy, use the Time Counter system which is consisting of photogate and Timer Counter.

NEW

Changing the Bob Position

The bob and pivot point can be shifted along the pendulum rod; use an L wrench to loosen and tighten the socket set screw bolt.

Experiment Graphics



Component List

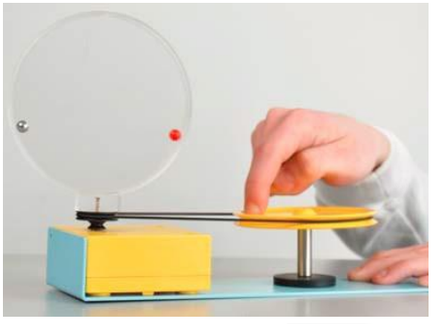
The components are assembled into a whole unit of Reversible Pendulum.

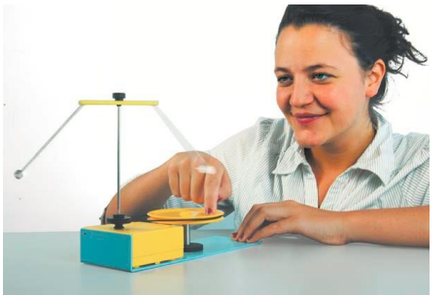
	Cat. code	Component	Description	Qty
a	ESP 125 01	Pendulum Rod	Stainless steel, Ø 10 × 750 mm.	1 pc
b	ESP 125 02	Knife Edge Pivots	Made of hard steel; dimensions 15 mm × 20 mm × 30 mm; with fixing screw.	2 pcs
c	ESP 125 03	Pendulum Bob	The pendulum has two bobs, each made of brass, dimension 38 mm × 23 mm, mass 200 g each, dilengkapi baut L.	2 pcs
d	ESP 125 04	Base for Knife Edge Pivot	Equipped with holder clamp for installation on the table.	1 pc
e	ESP 30/500	Stand Rod, 500 mm	Stainless steel, Ø 10 mm, length 500 mm.	1 pc
f	ESP 25/10	Stand Base A Shape 120 mm	Made from cast iron, equipped with stative stem lock nut.	1 set
g	ESP 36/04	Bosshead Clamp	Aluminum diecast, used to hold the Photogate.	1 pc
h	ESP 101 02	Photogate RP	Photogate sensor unit is using a LED and infrared fotodiode, mounted on a special holder for the Reversible Pendulum.	1 pc
i	ESP 100	Timer Counter AT-01	It is used to measure time. Display : 4 digits LED Time range : 0 ~ 999,9 second Power input : 220 V ±10% AC Photogate input : 2 Function : 7 functions Measurement unit : ms, s Electromagnetic output : 12 V	

Experiment Topics

P 12 05	Reversible Pendulum
P 12 08	Reversible Compound
P 12 09	Reversible Owen

P 12 05 Reversible Pendulum





Circular Motion Student Kit

With this set the following experiments can be performed:
Centrifugal force
Centrifugal force - suspended balls
Regulator for centrifugal force
Centrifugal force - earth flattening rings Rotating liquied
Rotating pendulum (Foucault pendulum)

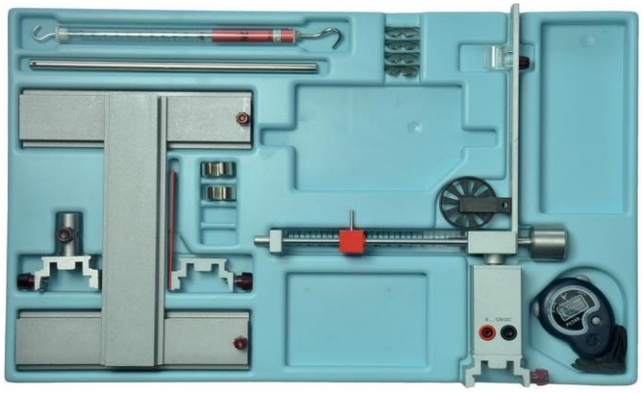
Kit consisting of:
1x Centrifugal hoops “compact”
1xWatt’s governor “compact”
1x Foucault’s pendulum “compact”
1x Floating disk “compact” 1x Locking screw M3, small
1x Steel balls ½” (12.7 mm), set of 2 1x Rotational dynamics
1x Pivot bearing with transmission gear
1x Magnetic base for drive pulley “compact” 1x Drive pulley “compact”, D = 100 mm
1x Drive belt “compact”
1x Assembly platform for MBCs
Storage:
1x Box insert Circular motion, SE
1x Storage box II small, with cover
Box insert plan with 2 labels.

ESP59752

Centrifugal Force Demonstrator

Use to show the effect of mass, radius, and velocity on the centripetal force of a rotating thread length 100cm , rod length : 17 cm , Pendant 10g X 7.

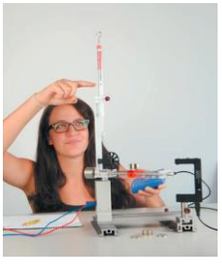
ESP59755

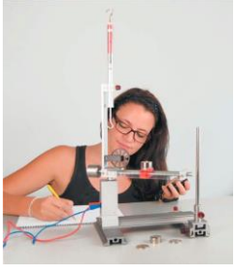


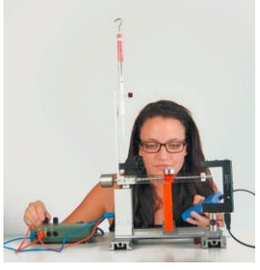
Centripetal Force Apparatus

Set includes the following :
1 Centripetal force apparatus with motor 1 Sliding saddle, H=40 mm
1 Slider with gate for centripetal force apparatus
2 Slotted weight, 50 g.
4 Slotted weight, 10 g.
1 Dynamometer 2 N, transparent
1 Hand-held stopwatch, digital, 1/100 s
1 Stand rail, 300 mm
2 Rail claw, simple.

ESP59754







Rotary pendulum kit

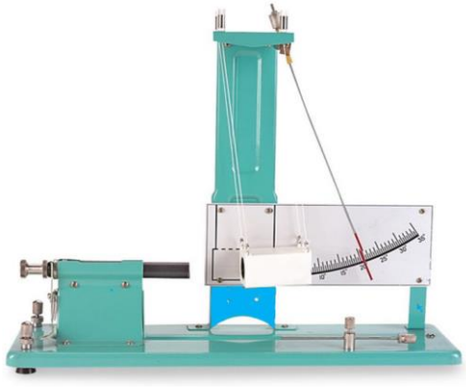
This apparatus is used to investigate oscillation as damping is varied. Free, forced and chaotic oscillation may be generated.
The resonator consists of a wheel with spokes, made of sheet copper and mounted on ball bearings, with a flat spiral spring. The resonator is excited by means of lever mechanics, using a drive motor connected to a cam.
Rough or fine adjustment of motor speed is possible. Damping is provided by an eddy current brake. Surrounding the resonator is a scale shaped like a ring. Slits in the scale and pointers on the resonator and exciter lever can be used to project shadows for better visualising how the experiment works. Apparatus mounted on a base plate.
Motor power supply: 24 V DC, min. 600 mA
Damping unit power supply : 0 - 12 V DC, continually variable
Dimensions : 400 x 140 x 270 mm

ESP59765

Pendulum Clamps

Any one of the pendulums can be adjusted without disturbing the others 28cm long clamp consists of a support arm attached to a rod clamp. Thumb screws keep suspended cords secure.

ESP59760



Ballistic Pendulum Apparatus

Unit uses a nylon pendulum with a tapered rubber insert. Both pendulum and base have levelling screws. Spring-loaded gun has a self-locking trigger and a rubber bumper to prevent damage on impact. The scale is marked in degrees and is registered by a counter-weighted needle that remains in place at the height of the arc. Grades 9-12.

ESP59763

Pendulum Bobs

Pendulum Bobs, Comprising a solid sphere with a small ring for suspension. Different Diameter and Material.

ESP59768	Dia :13 Mm	Brass
ESP59769	Dia : 19Mm	Brass
ESP59770	Dia : 25Mm	Brass
ESP59775	Dia :13 Mm	Copper
ESP59776	Dia : 19Mm	Copper
ESP59777	Dia : 25Mm	Copper
ESP59789	Dia :13 Mm	Lead
ESP59790	Dia : 19Mm	Lead
ESP59791	Dia : 25Mm	Lead
ESP59796	Dia :13 Mm	Aluminium
ESP59797	Dia : 19Mm	Aluminium
ESP59798	Dia : 25Mm	Aluminium
ESP59782	Dia :13 Mm	Iron
ESP59783	Dia : 19Mm	Iron
ESP59784	Dia : 25Mm	Iron

Photo Gate With Timer Set Economy

Photogates with cords,
AC and Digital Timer 7 function with memory includes Electromagnet function for G by Free Fall apparatus

ESP59759

NEW

Photo Gate With Timer Basic Set

Robust, handy counter with LCD display, digit height 12.5 mm, measuring accuracy 10 ms, battery-operated,
operating modes: - stopwatch - start / stop - gate - 2 pieces of fork light barriers, fork width: 78 mm - 2 pieces of connecting cable, L = each ; approx. 135 cm

ESP59758

Accelerated Motion

Students investigate accelerated motion using a totally reusable system with six foot tubular ramps, toy cars, bearings, and other required materials. This simple apparatus allows students to use timed trials to measure gravitational acceleration and the car's/ball's Coefficient of friction. High school curriculum includes kinetic and static coefficients of friction as well as bodies on inclined planes. Includes instructor's manual, reproducible stepwise student instructions, guided calculations including graphing of data and calculation of error, assessment questions, sample data, and complete answer keys. Appropriate for any level Physics course (including AP) as well as general science courses. Includes separate problem sets for general science and higher level Physics courses. Designed for working in groups of four to six, with materials included sufficient for up to 36 students. Meets national standards for grades 9-12.

ESP59800

Friction Block, Multifunctional, 40X40x160mm

For experiments on static, dynamic and rolling friction Surfaces: Wood, rubber, leather and abrasive paper Wooden area can be doubled when opening the body. **Dimensions :** 40 x 40 x 160 mm | Mass: approx. 200 g.

ESP59911

Friction Block

Aluminum block with 2 socket 4 mm for attaching plug-in components. Use with the dynamometer for frictional forces in static and sliding friction.

2 Surface are rubber coated.

Overall Dimensions : 50 x 40 x 20 mm Material : Aluminum and rubber

Part of Mechanic Kit for Junior High School (ESP59740).

Dimensions : (L) 5.00 x (W) 4.00 x (H) 2.00 cm

ESP59802

Ticker Tape Timer 1

This is a modern version of a Ticker Timer, enclosed in a plastic moulded case with a provision of 20/S and 50/S striking rates to determine the velocity and acceleration of a dynamic cart. Operates on 6volt AC.

ESP59804

Ticker Tape Paper Roll 50 Mtr

50mtr of paper tape roll

ESP59805

Ticker Tape Timer Carbon Disc, 50Mm Dia

Carbon paper disc, 50mm dia, cut from carbon paper pasted on hard paper sheet for long life durability and reusable. Box of 50.

ESP59806

Ticker Tape Timer, Superior

Two Crystal-controlled, Calibrated Frequencies: (10 Hz and 50 Hz), accurate to 0.1%. The 50-Hz frequency is ideal for free fall experiments. The slower 10-Hz frequency is best for most dynamics track experiments. Includes an Internal 9-V Battery, or Use an Optional External 9-V AC Adapter/ Power Supply. Carbon Paper Discs: Used for printing. The adjustable disc holder allows the printing point to be adjusted, giving a long life to the discs.

ESP59807

Ticker Tape Timer 2

For recording one dimensional motions (type motion, speed, acceleration) of a trolley or falling weight by analysing ticks on 9.5 mm ticker tape which are produce at fixed frequency together with motion of the objects.

Dimensions : :
-140 x 70 x 60 mm
-**Weight:** 140 gr
Supply Voltage: 3-6 V, AC / DC
Time marker: 50 Hz
Pulse width : 0.02 second
Dimensions : (L) 14.00 x (W) 7.00 x (H) 6.00 cm
Weight: 0.140 kg

ESP59808

Ticker Tape Timer 2 With Electronic Synch.

For recording one dimensional motions (type motion, speed, acceleration) of a trolley or falling weight by analysing ticks on 9.5 mm ticker tape which
are produce at fixed frequency together with motion of the objects.

Dimensions :
-Overall 140 x 70 x 65 mm
-**Weight:** 154 g
Supply Voltage : 3-6 V, AC / DC
Time marker : 50 Hz
Pulse width : 0.02 second
Used neodymium magnetic on the bat plate
Complete with electronic circuits for synchronizing vibration
Dimensions : (L) 15.32 x (W) 8.32 x (H) 8.14 cm
Weight: 0.185 kg

ESP59809

Ticker Tape Timer 2 With Clamp Rider

For recording one dimensional motions (type motion, speed, acceleration) of a trolley or falling weight by analysing ticks on 9.5 mm ticker tape which are produce at fixed frequency together with motion of the objects.
Overall **Dimentions :** 140 x 70 x 86 mm
Supply Voltage : 3-6 V, AC/DC
Time marker : 50 Hz Pulse
width : 0.02 second
Use with Trolley and Precision Rail. For the paper tape spare can be used Paper Tape, for Ticker Timer.
Dimensions : (L) 14.00 x (W) 7.00 x (H) 8.60 cm
Weight: 0.154 kg

ESP59810

Ticker Tape Timer Electronic For Dynamic Kit

For recording sequences of linear motion on a track or during free-fall experiments by means of markings on metallic paper ESP59812
Selection switch: 10ms - off - 100ms
Voltage source: 12 V DC **Dimensions**
: 84x84x66 mm

ESP59811

Metallic Paper, Roll For Ticker Tape Timer Esp59811

Recording paper for ticker tape timerESP59811, Length: approx. 30 mm, W=15 mm

ESP59812

Dynamics Trolley, Demo, 120X68 mm

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

Dimensions of trolley body: 120x66 mm.

ESP59814

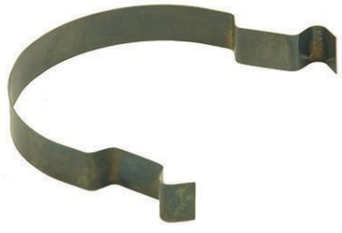
Car Body For Trolley ESP59814

Can be attached to ESP59814 Dynamics trolley

ESP59815

Adapter For Inelastic Collision For Trolleys ESP59814

ESP59818



Flat Spring For Collision Experiments With Trolleys ESP59814

For demonstrating the law of conservation of momentum

Elliptically shaped steel flat spring with 4 mm plug pin, may be inserted into dynamics trolley demo ESP59814

Spring width: 10 mm

ESP59816

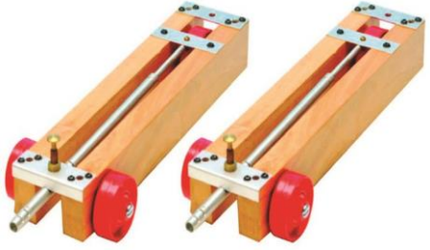
Spring Bumper For Trolleys ESP59814

For demonstrating the law of conservation of momentum; elliptically-shaped steel flat spring with 4 mm plug pin, may be inserted into dynamics trolley demo ESP59814

Spring width: 10 mm

Weight : 10g

ESP59817



Dynamic Trolley, Wooden

This pair of identical wooden trolleys 300mm long mounted on three wheels. A spring loaded rod is fitted to give impulse when released. Supplied complete with 3 elastic rings, 3 springs, 8 pins (for stacking), 2 rubber corks, 2 needles and 1 releasing pin.

ESP59819

Dynamic Trolley Set, Superior

This pair of identical wooden trolleys 300mm long mounted on three wheels with ball bearings and a spring loaded plunger is fitted to give impulse when released. Another trolley mounted on four wheels with ball bearings to give friction-less experiments. Supplied complete with 3 elastic rings, 3 springs, 4 pins (for stacking), 2 rubber corks. Supplied with 2 Masses and 2 Height Adjustable Pulleys.

ESP59821

Hall's Car Single

Study the relationship between work and energy with this virtually frictionless plastic-wheeled car. Plastic-moulded body has a deep central well for weights and covered wheels that snap back into place if dropped. High-tech partially recessed sleeve bearings never need adjustment. Instructions. Hole at one end for attaching strings.

ESP59827

Dynamic Trolley For Mechanic Kit With Motor

Trolley with DC motor designed for mechanical experiment, especially for linear motion. Have a clip mounted on trolley body to hold end of ticker tape.

Can be run on precision rail with two kind of velocity. Equipped with 2 pcs 1.5V AA battery.

Dimentions : 98 x 52 x 56 mm

Material :

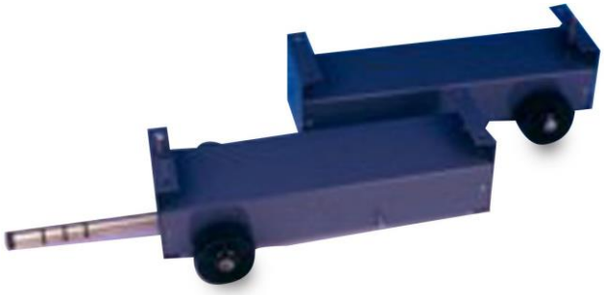
- Cart : Aluminium -Wheel : Plastic ;Equipped with speed control switch and socket 4 mm Mass approx. : 200 g

Part of : Mechanic Kit for Junior High School (37 items), Mechanic Kit for Junior High School, Mechanic Kit for Junior High School, Mechanics Kit for Senior High School (37 items), Physics Experiment Tools Package for Senior High School

Dimensions : (L) 12.00 x (W) 6.00 x (H) 7.00 cm

Weight : 0.200 kg

ESP59825



Dynamic Trolley (Cart), 1 Kg

A pair of trolleys (carts) the body of which is made of metal plate, with wheels made of plastic on ball bearings so that it move with very small friction. One of the cart is provided with clamps bands and three level spring loaded plunger.

Overall **Dimentions :** 41 x 14 x 17.5 cm

Material :

- Cart : Steel
- Wheel : Plastic

The mass of each cart is 1000 g (1% accuracy)

Dimensions : (L) 41.00 x (W) 14.00 x (H) 17.50 cm **Weight :** 1.980 kg

ESP59823

NEW

Trolley Runway 1.5x0.3 mts

Trolley Runway 1.5x0.3mts

Designed to provide a smooth, flat, easily inclinable surface for dynamics experiments using trolleys. With metal side rails and plastic fee

ESP59832

Dynamic Trolley With Variable Speed

Battery powered, for experiments on uniform movement, Potentiometer for stage-less adjusting of the speed. Mode switch: Ahead/Off/Back, sockets for external power supplying(non - uniform movement), Battery (9V) can be changed without opening the housing

ESP59830

Trolley With Motor

Trolley with DC motor designed for mechanical experiment, especially for linear motion. Have a clip mounted on trolley body to hold end of ticker tape. Can be run on precision rail with two kind of velocity. Equipped with 2 pcs 1.5V AA battery.

Dimentions : 98 x 52 x 56 mm

Material :

-Cart : Aluminium

-Wheel : Plastic

Equipped with speed control switch and socket 4 mm Mass approx. : 200 g

Part of :

Mechanic Kit for Junior High School (37 items), Mechanic Kit for Junior High School, Mechanic Kit for Junior High School, Mechanics Kit for Senior High School (37 items), Physics Experiment Tools Package for Senior High School,

Dimensions : (L) 12.00 x (W) 6.00 x (H) 7.00 cm,

Weight : 0.200 kg

ESP59829

Stand Rod 10 X 100 Mm, Stainless Steel

inUsed as pillars in some experiments.

Dimentions : 10 x 100 mm

Material : Stainless steel solid Part of Mechanics Kit for Senior High SchooL.

Dimensions : (L) 10.00 x (W) 1.00 x (H) 1.00 cm

ESP59834

Stand Rod 10 X 1000 Mm, Stainless Steel

Dimentions : 10 x 1000 mm

Material : Stainless steel solid Part of Free Fall Apparatus. **Dimensions :** (L) 100.00 x (W) 1.00 x (H) 1.00 cm **Weight :** 0.000 kg

ESP59835

Meter Ruler

Meter Ruler Wooden , 1 meter length graduated in CM/DCM

ESP59847

‹G› By Free Fall Apparatus – Superior

This easy to operate system is designed to demonstrate uniform acceleration due to gravity and its determination and to demonstrate conservation aof mechanical energy.

Components:

Support (1.80 m height)

Electromagnet to hold the ball

highly sensitive photoelectric

sensors Graduated ruler (1.50m length)

Ball receptacle Stable cast base

screws to adjust the support in the vertical plane

Principle:

The electromagnet holds the steel ball at the top of the support.

When you press the button on the control box the ball falls down.

During the motion the ball starts and stops the clock using the photo cells.

Supplied with Digital Timer feature with Electromagnetic Control.

ESP59838

Freefall Apparatus

ESP59840

- This apparatus is designed for help the student in understanding the free fall, viz.: falling steel ball time measurement, inspecting the relationship between the altitude and the time taken, and measuring the gravity acceleration.
- Timer counter AT-01 usage makes it possible to measure the free fall time accurately up to 100 micro second graduation. Free fall time is measured by using two photogates. When the ball is released, the Timer Counter is automatically start counting the time. The Timer Counter will read the time of the ball from the magnetic holder through each of photogates. When the ball has passed the second photogate then the Timer Counter will automatically stop measuring.

Component List

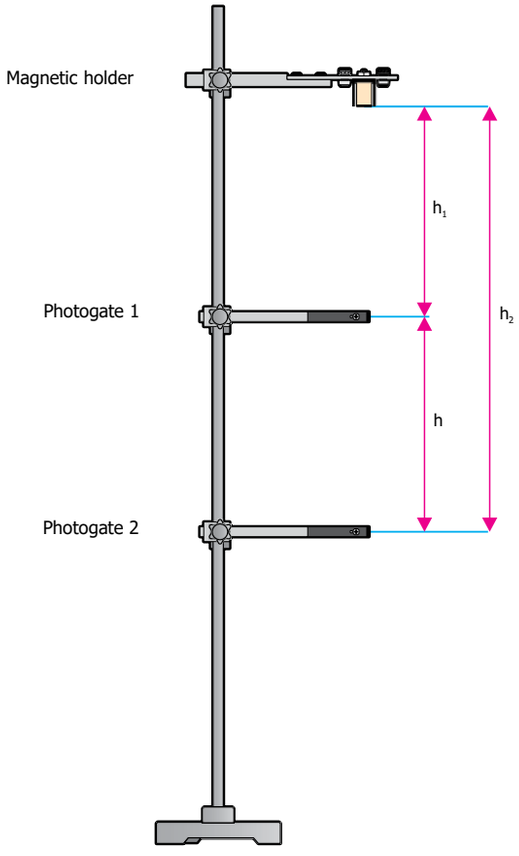
The components are assembled into a whole unit of Freefall Apparatus.

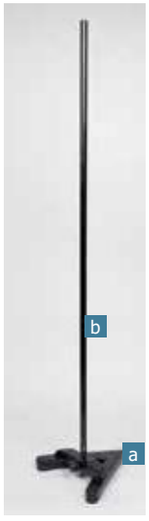
Cat. code	Component	Description	Qty
a ESP 25/30	Experiment Board	Die cast iron, equipped with locking bolt.	1 pc
b ESP 30/100	Stand Rod Ø 10 × 1000 mm	Stainless steel, 10 mm, length 1000 mm.	1 pc
C ESP 102	Electromagnet Steel Ball Holder	Electromagnetic unit to hold and release steel ball, triggered by Timer counter AT-01. 12 volt DC. Max. current 0.2 A.	1 pc
d ESP 101 03	Photogate FA	Sensor unit for photogate, using LED and infra red photo diode, mounted on special bracket specifically designed for the Free Fall apparatus.	2 pcs
e ESP 161 01	Steel Ball Ø 19 mm	Steel ball, 19 mm diameter.	1 pc
f ESP 160	Plumb Bob	To adjust photogates and magnet releaser in vertical position.	1 pc
g ESP 36/04	Bosshead Clamp	Die cast aluminum; used to hold the Magnetic holder and Photogate.	3 pcs
h ESP 221	Measuring Tape 3M	Length is 3 m.	1 pc
i ESP 230 14	Connecting Lead for Electromagnet	For connecting of the voltage source to the Magnet Ball Releaser. Cable with 4 mm connector plug is to connect the magnetic holder to the Timer counter, length 1.5 m.	1 pc

Mechanics

Cat. code	Component	Description	Qty
j ESP 25/30	Timer Counter AT-01 time	It is used to measure	1 pc
	Display	: 4 digits LED	
	Time range	: 0 ~ 999,9 second	
	Power input	: 220 V ±10% AC	
	Photogate input	: 2	
	Function	: 7 functions	
	Measurement unit	: ms, s	
	Electromagnetic output	: 12 V	

Freefall Apparatus Setup





Timer Counter

This apparatus is designed to be used together with Air track, but it can be use with Atwood machine, Free fall apparatus, Reversible pendulum, Moment of inertia apparatus and other that needs high accuracy automatic measurement.

This apparatus has two main function, as a timer and as a counter.

Timer counter is used together with 2 or 4 photo gates as the sensors. Photogate has the ability to sense the transition between dark and light and vice versa which is caused by an object passing through the gate.

Description	ESP 100	ESP 105
Display mode	4 digits LED	4 digits LED
Timer Range	0 ~ 999,9 second	0 ~ 999,9 second
Voltage Input	220 V ±10% AC	220 V ±10% AC
Photogate input	2	4
Speed metrical range	-	0,01 cm/s ~ 999 cm/s
Acceleration metrical range	-	0,01 cm/s ~ 999 cm/s²
Signal Source output	-	0,1 ms, 1 ms, 10 ms, 100 ms, 1000 ms.
Function	7	8
Measuring Unit	ms, s.	ms, s, cm/s, cm/s²
Electromagnet output	1	1

Free Fall Apparatus Superior

This apparatus is used for acceleration experiment by gravity and energy conservation law Attaching a steel ball to the upper part of the support for experiment and pressing the switch of the controller causes the ball to fall off.

- The steel ball can be measured with a stopwatch using an optical sensor.

Configuration: 1 / 1000sec with stopwatch, electromagnet, cylindrical support, optical sensor with 2 tape measure

Dimensions : 220x160x1500mm

ESP59842

Free Fall Demo Kit

KIT Includes : Falling body apparatus “Jumbo” Timer for falling body apparatus Support base, large, L=500 mm, Boss-head cross-pattern, demo 03, Support rod, squared, L=750 mm

ESP59843

Free Fall Tube

Students may expect that lighter objects experience a lesser acceleration than heavier objects. That idea is supported by observing that when a piece of paper and a pencil are dropped simultaneously from the same height, the pencil reaches the ground first. What the students overlook is the action of aerodynamic force on the paper, which counteracts the gravitational influence. By evacuating air from the Free Fall Tube, the aerodynamic forces can be virtually eliminated as a variable in the demonstration. As a result, objects will fall with the same acceleration and reach the bottom of the tube at the same time. Consists of a plastic tube that is closed at each end by a vacuum-tight cap. The bottom cap is fitted with a stopcock for air evacuation.

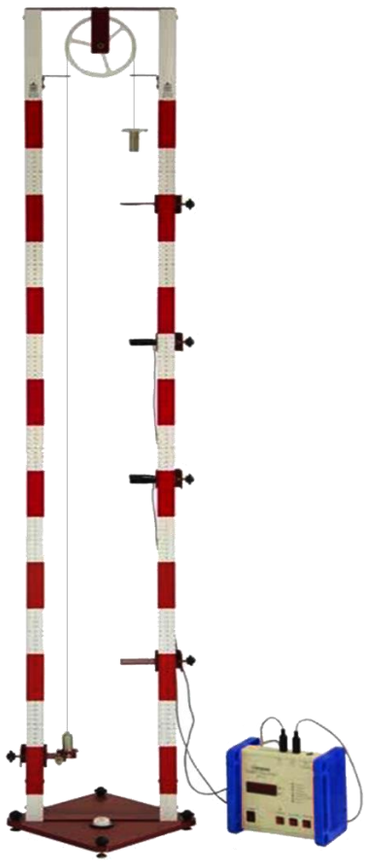
ESP59845

Atwood Machine

ESP59849

Junior High School
Senior High School

- Uniform acceleration.
- Uniform motion.
- Verification of Newton II law about motion.
- Measuring gravity acceleration.



The name of Atwood machine was discovered by an English scientist, George Atwood (1746-1807). This apparatus is consisting of two equal loads which are connected with a small mass thread. The thread is passed through with small mass pulley and almost friction free. At first this apparatus is used to learn the motion concept and to measure the earth gravitation acceleration, g.

When doing physics experiment using Atwood machine, the object motion is relatively slow, the load motion
is accelerated. This machine is used to understand the Newton law II about motion.

The increasing velocity on Atwood machine depends on two transformers (force is F and mass is M, where a=F/M). One transformer is kept in fix value, while the other value is changed.

By making various unbalance load weight, object should move accelerated, one load moves upward and the other, which is given an additional load, moves downward. Increasing velocity resultant is measured from experiment data and the result is compared using Newton law II about motion calculation.

The time in the experiment by using the atwood machine can be measured by using a stopwatch or for better accuracy, it is suggested to use time system
measuring unit which consists of Photogate and Timer Counter.

Component List

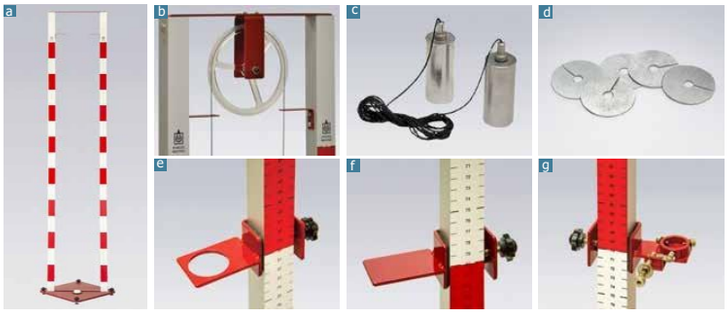
The components are assembled into a whole unit of Atwood Machine.

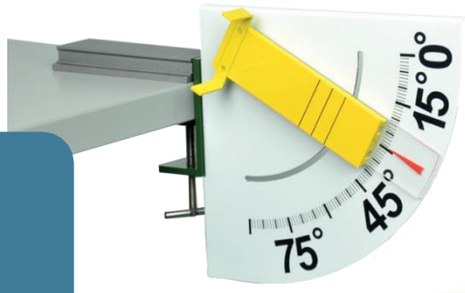
Cat. code	Component	Description	Qty
a ESP 135 01	Pillars with Scale	Consist of two aluminums square pillars with scale in centimeter; dimension 32 × 32 × 1500 mm; mounted on metal base 250 × 250 × 10 mm with adjustable leveling foot.	1 Set
b ESP 135 02	Pulley Ø 120 mm, Flexiglass	Light Plexiglas Ø 120 mm; made from plexiglass materials with diameter 120 mm; using conus bearing system to minimize the friction.	1 Set
C ESP 135 03	Cylinder Mass with Cord	Two masses made from brass, nickel platted, 100 g Ø 48 mm, each other is tied by using the 1700 mm nylon cord.	1 Set
d ESP 135 04	Slotted Mass	Made of aluminum, 5 g × 5, Ø 48 mm	1 Set
e ESP 135 05	Catcher Platform	Made of steel and painted, is used to stop the Slotted Mass (PMK 135 04), can be shifted upwardor downward along the pillar.	1 pc
f ESP 135 06	Stopper Platform	Made of steel and painted, is used to stop the mass (PMK 135 03), can be shifted upward or downward along the pillar	1 pc
g ESP 135 07	Mass Holder with Release Mechanism	Made of steel and painted, with spring knob which is used to hold and release the mass, can be shifted upward or downward along the pillar.	1 Set

Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. code	Tool	Qty
ESL57745	Stopwatch, Analog	1 pc
ESP 101 04	Photogate AM	2 pcs
ESP 100	Timer Counter AT-01	1 Set





Ballistics Base Unit, Demo

For demonstrating ballistics using solid bodies or liquids; large metal scale with a coloured pointer, easily adjustable and lockable in position; hence readings can be taken from large distances; with the mounted table clamp and stand rail base profile the apparatus can be fixed to tables with a thickness of 48 mm; metal bracket for holding the launching ball;
digit height on scale : 26 mm; **Dimensions :** 260 x 210 x 35 mm Please note: To perform the experiments, either a water throwing unit or a ball throwing unit is required!!

ESP59852

Projectile launcher 2

May be used as launcher allowing consecutive launching with the same force, for dynamics experiments involving a track; Long pin with 3 striations for adjusting and setting different speeds of launching, with tension spring, easily trigger-able trigger cylinder as well as a finger grip for tensioning the spring; may be fastened to special aluminium rail profile;
Dimensions : 240 x 60 x 50 mm

ESP59855

Projectile Launcher

A spring loaded gun hold two plastic balls on firing the gun, One ball falls straight down while the other is projected horizontally. The audible clicks when they strike the floor are simultaneous.
Size **Pipe :** -175 x 60 x 350 mm - ID 16 mm - OD 20 mm **Plastics ball :** Hole centre 2 mm - Ball 15.5 mm **Material :** Plastic

ESP59854

Inertia Apparatus

The plastic ball rests on the card - when you pull back the spring, the card shoots forward, but the ball returns to its perch on the post. This device illustrates the effect of inertia. To the observer, the ball seems not to have moved at all. Kit contains: plastic ball, stiff card, acrylic base, support post with cone-shaped depression, hardware to attach post and spring to base, and instructions. Grade 6 and up.

ESP59857

Ball Gun, Unit For Ballistics Base Unit ESP59852

For demonstrating ballistics using a large ball, long pin with three striations for setting different launch speeds with tension spring, easily ;-triggerable trigger cylinder with finger grip for easy tensioning of the spring; may be fastened to the ballistics apparatus or ES rail profiles; incl. Wooden ball and hollow plastic sphere, D = 60 mm each; Please note : Ballistics apparatus (ESP59852) required to perform the experiments!
Dimensions : 180 x 54 x 60 mm

ESP59853

NEW

Magnetic Gun 3 Stage

gun demonstrates projectile acceleration by using a magnetic chain reaction. Each time a ball bearing impacts the magnet, the following projectile moves faster.
Track Length: 1000mm. Contents include: 3 x Magnets 2 x 16mm ball bearings 8 x 20mm ball bearings
Spare rail for the smaller ball bearings

ESP59850

NEW

Gaussian Gun

Gauss gun project : Explore the wonders of magnetism with our Gauss gun project. gauss gun project Tested By The Experts, 100% working guartenteed best project components and kits by Santosh Project Maker Pvt Ltd. For motivating and helping students in improving their skillsets and academic projects

ESP59851

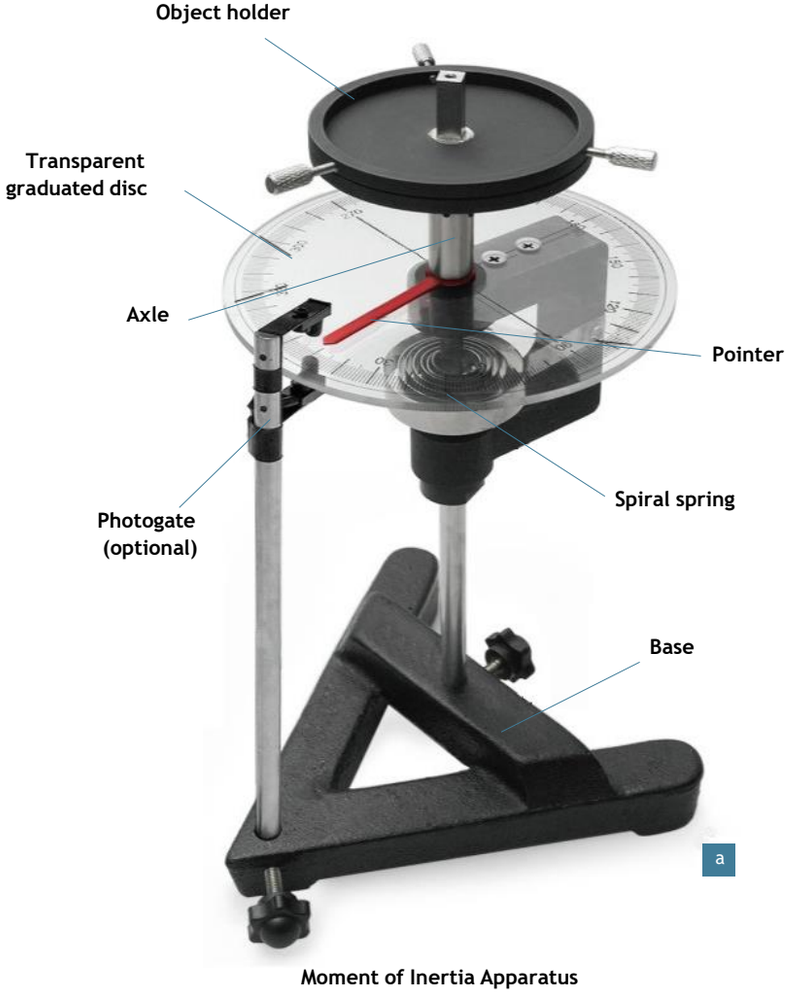
Senior High School

Moment of Inertia Apparatus

ESP59858

NEW

Moment of inertia apparatus is designed to determine the moment of inertia of many kind of objects by oscillation method. Oscillation is initiated by torque which is applied to the spiral spring mounted on the axis of this device. The moment of inertia of an observed object can be discovered by measuring and calculating the oscillation interval. Prior to experiment, spring constant should be determined.



Moment of Inertia Apparatus

Advantages

- This is a complete set for an easier experiment execution.
- Simple design; using a high quality spring and ball bearings to lessen the friction.
- Pointer and degree graduated transparent disc for an easier measurement.
- Experiment objects can be rigidly mounted on the object holder for an accurate experiment result.
- Oscillation interval measurement can be done manually by using a stopwatch or Timer Counter AT-01 and photogate for a more accurate, which can record up to 20 measurement data

Component List

The system consists of the moment of inertia apparatus, completed with 8 pieces of test objects.

	Cat. code	Component	Description	Qty
a	ESP 380.00	Moment of Inersia Apparatus	Dimension: 180 × 190 × 300 mm, completed with pointer deflection and transparent scale in degree,0-360°. This scale will assist in determining spring constant of moment of inertia apparatus. In addition, this apparatus is completed with photogate to measure the period accurately when it is connected with Timer Counter AT-01	1 Set
b	ESP 380.01	Solid Ball	Wood, Ø 110.9 mm, nominal mass 500 g	1 pc
c	ESP 380.02	Solid Cylinder	Wood, Ø 80 mm × 143 mm, nominal mass 500 g.	1 pc
d	ESP 380.03	Hollow Cylinder	Steel, Ø 80 mm × 100 mm, nominal mass 500 g	1 pc
e	ESP 380.08	Disc with Holes	Aluminum disc, Ø 250 mm and 2 mm thick, mass 260 g; especially used for verification of the Steiner's theorem.	1 pc
f	ESP 380.04	Disc Ø 213 mm	Wood, Ø 213 mm × 20 mm, nominal mass 500 g.	1 pc
g	ESP 380.05	Disc Ø 174 mm	Wood, Ø 174 mm × 30 mm, nominal mass 500 g	1 pc
H	ESP 380.06	Solid Cone	Wood, Ø 146 mm x 130 mm, nominal mass 500 g.	1 pc
i	ESP 380.07	Dumbbell	2 pcs adjustable brass weight, cylindrical form Ø 26 x 25 mm, mass 100 g; mounted on aluminum tubing, Ø 8 mm x 500 mm, mass 32 g.	1 Set

Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. code	Tool	Qty
ESP 101 05	Photogate MI	1 pc
ESP 100	Timer Counter AT-01	1 pc
ESL57745	Analog Stopwatch	1 pc

Experiment Topics

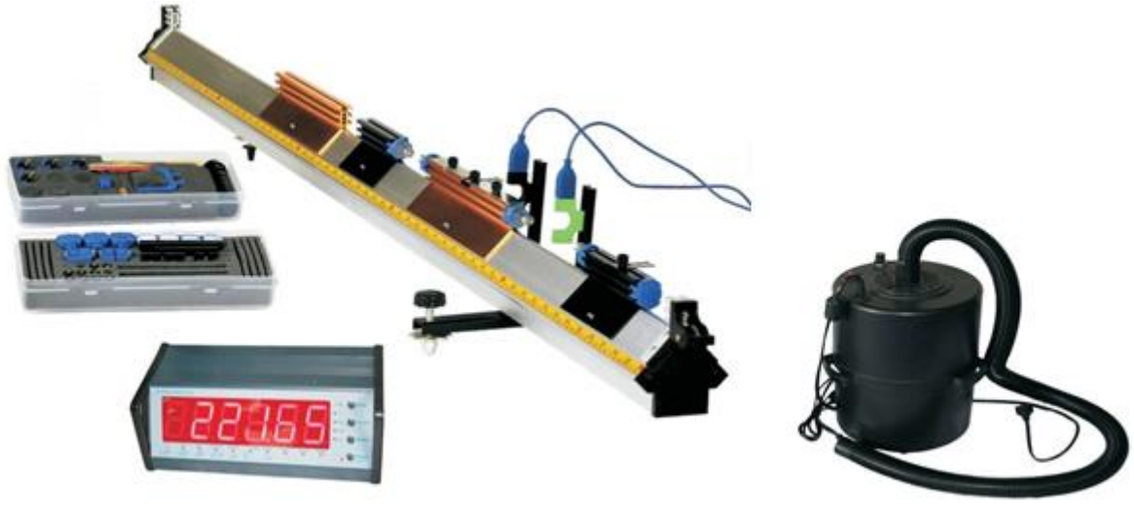
M 01	Spiral Spring Constant of Moment of Inertia Apparatus
M 02	Moment of Inertia of Body
M 03	Steiner's Theorem
M 04	Moment of Inertia of Bar
M 05	Inertial mass of Dumbbel

MI-01 Spiral Spring Constant of Moment of Inertia Apparatus

MI-02 Moment of Inertia of Body

Air Track System

ESP59860EC/XXX



Air Track And Accessories Set

Here's a great value in a student air track. Study one-dimensional motion, collisions, and the conservation of momentum at low friction. Our sturdy triangular aluminium extrusion track is lightweight yet durable and can be used without a support stand , Available in 3 different Length :1500 mm , 2000 mm , 2400 mm

The air track is also used to study collisions, both elastic and inelastic. Since there is very little energy lost through friction it is easy to demonstrate how momentum is conserved before and after a collision. The track can be used to calculate the force of gravity when placed at an angle .

Overall Available sizes : 1600*300*150 mm , 2100*300*150 mm , 2500 * 300 * 150 mm

Weight : 7kg

SKU NO : **ESP59860EC/150** **ESP59860EC/200** **ESP59860EC/240**

Air Track Accessories Set, includes the following:

(2) 100g Aluminum sliders	(2) low friction pulleys
(4) spring bumpers	(2) Velcro bumpers
(10) thumbscrews.	(2) 50 g masses
(1) spool of thread	(4) 25g masses
(2) end brackets	(4) end bumper assemblies
(4) springs (2 pairs)	(2) holders for photo gates
(1) bucket	(10) 5g Slotted Weight
(4) rubber bands	(4) flags
(3) connecting brackets	(4) gaskets ,thickness 10mm

Smart Timer & Photo Gate Set:

Smart Timer:

The purpose of this device is to allow precise timing of physics motion experiments with Air Tracks. The Escience Smart Timer has seven separate functions and may be used to count time, measure acceleration when used with air track and collision devices. It has a six digit LCD Display and a timer range up to 9999 milliseconds, with an accuracy of 1/100th of a millisecond. The timer conveniently displays its functions with a large graphical user interface ,Supplied with 2 photogates .
Overall size ：250*145*110mm Product Weight：0.8KG

Photo Gates:

2 Photo Gates can measure the time interval between two photo-gates, measure the time in takes to pass through one photo-gates ,measure acceleration of a released ball ,determine the acceleration due to gravity(with a picket fence).determine elastic and inelastic collision times, calculate cycles ,determine the frequency of a rotating object ,determine the period of a pendulum ,and count time with great accuracy.
Size: 90*80*25MM

ESP59860EC/Timer

Air Source

Variable High-output air source and min power air source are designed with noise-reduced technology.
it's powerful enough to float fully-loaded gliders or pucks.
Supplied with 1.5 meter long air hose suitable for all our air tables and air track.
Size:φ300*380mm
Weight：3kg

ESP59860EC/Air

Air Trak System
ESP59860SP/XXX
following :

ESP59860EC/150	Air Track And Accessories	1 Set
ESP59860EC/Timer	Smart Timer With Photo Gate	1 Set
ESP59860EC/Air	Air Source	1 Set

Air Track

ESP59860 & ESP59865

Senior High School

Junior High School

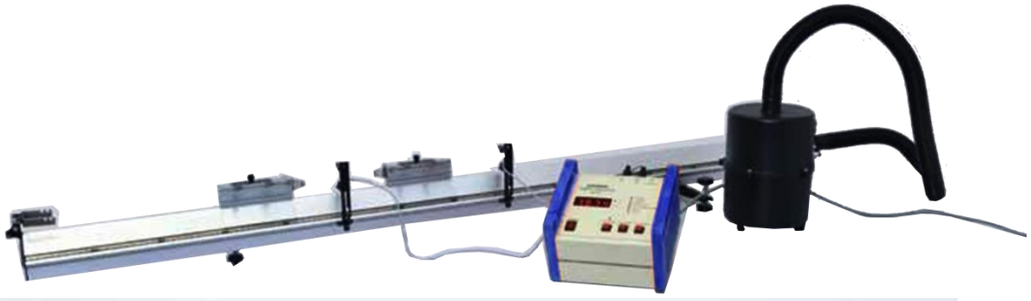
Physics

- Very ideal for kinematic and dynamic experiment which need friction free state, so that the experiment result will be quantitatively better.
- Air track is equipped with photogate and timer counter which are specially designed to study the basic law of motions, such as:
  - Uniform motion
  - Uniform acceleration
  - Instantaneous and average velocity
  - Newton's law of motion
  - Conservation of momentum
  - Conservation of energy
  - Simple harmonic motion

Component List

Cat. code		Component	Description	Quantity	
				Air Track 1,5 m ESP59860	Air Track 2,0 m ESP59865
Track					
ESP 140 01	**a**	Air Track 1.5 m	Made of extrusion aluminum, the surface is straight and flat.	1 pc	-
ESP 145 01		Air Track 2 m	Made of extrusion aluminum, the surface is straight and flat.	-	1 pc
Blower					
ESP 140 05	**b**	Blower, 250W	Has soft sound.	1 pc	1 pc
ESP 030 05	**c**	Hose 2 m	Elastic hose, 2 m in length.	1 pc	1 pc
Timer					
ESP 100	d	Timer Counter AT-01	Has seven functions.	1 pc	-
ESP 105		Timer Counter AT-02	Has seven functions and able to measure the velocity and the acceleration automatically.	-	1 pc
ESP 101 01	e	Photogate	Sensor is connected to timer counter. It detects the glider in certain positions.	2 pcs	2 pcs
Accecories					
ESP 145 04	f	Glider 120 mm	Made of aluminum, easy to move on the track without friction due to the air layer below the glider.	2 pcs	2 pcs
ESP 145 04	g	Glider 240 mm	Made of aluminum, easy to move on the track without friction due to the air layer below the glider.	-	2 pcs
ESP 140 26	h	Additional Load 12.5 g	Mounted on glider using the screw.	4 pcs	4 pcs
ESP 140 27	i	Additional Load 25 g	Mounted on glider using the screw.	4 pcs	4 pcs
ESP140 08	j	Light Barrier Double Strip	There are 4 sizes of double strip light barrier: 1 cm, 3 cm, 5 cm, and 10 cm.	1 set	1 set
ESP 140 09	k	Light Barrier Single Strip	Used in Simple Harmonic Motion experiment.	1 pc	1 pc
ESP 140 12	l	Launching Cradle	Mounted on the end of track to launch the glider and prevent the collision between glider and end of track.	1 pc	1pc

Cat. code		Component	Description	Quantity	
				Air Track 1,5 m ESP59860	Air Track 2,0 m ESP59865
ESP 140 13	m	Spring Buffer	Made of lithe metal, involute. Used in perfectly elastic collision experiment.	3 pcs	4 pcs
ESP 140 14	n	Velcro	Used in inelastic collision experiment, makes the gliders sticking together.	1 set	1 set
ESP 140 15	o	Pulley	Mounted on the end of air track for placing the cord.	1 pc	1 pc
ESP 140 16	p	Slotted Hanger	Can be tied on the glider to provide a constant force.	1 pc	1 pc
ESP 140 17	q	Slotted Mass, 5 g	Hanged on the slotted hanger.	4 pcs	4 pcs
ESP 140 18	r	Small Block, 10 mm	For adjusting the tilt of air track.	2 pcs	4 pcs
ESP 140 19	s	Heel	For sustaining the foot of air track so it will be easier to set the track.	2 pcs	3 pcs
ESP 140 28	t	Vibrator Spring Ø 9 x 48 mm	Used in simple harmonic motion experiment	2 pcs	2 pcs
ESP 140 29		Vibrator spring Ø 9 x 98 mm	Used in simple harmonic motion experiment		2 pcs
ESP 140 21	u	Photogate Holder	For installing the photogate on the track.	2 pcs	2 pcs
ESP 140 22	v	Rubber Strip	Mounted on spring buffer to prevent the collision between the end of air track and the glider.	5 pcs	5 pcs
ESP 140 23	w	Cord with Hook	For hanging the slotted hanger and hook it to the glider.	1 roll	6 pcs
ESP 140 25	x	Screw	To hook the cord and the vibration spring on glider.	3 pcs	1 roll
ESP 140 24	y	Hoop	For mounting accessories on glider.	12 pcs	14 pcs
ESP 145 06	z	Adjustable End Stop for Air Track, 2 m	For hooking the spring on the hoop that mounted on stopper.	1 pc	1 pc
ESP 20.14/112 aa		Bar Magnet	For collision experiment.	2 pcs	2 pcs
ESP 140 13	m	Spring Buffer	Made of lithe metal, involute. Used in perfectly elastic collision experiment.	3 pcs	4 pcs
ESP 140 14	n	Velcro	Used in inelastic collision experiment, makes the gliders sticking together.	1 set	1 set

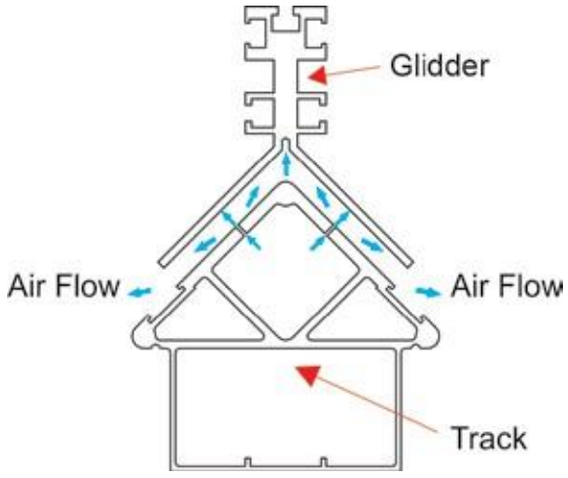


How Does Air Track Work?

Air track is made of extruded aluminum triangle pipe. Pressured air is pumped from a blower to one end of the pipe, the air then comes out from small holes which are existed in along the track.

The air flow which comes out will form a layer between the track and the glider causing the glider to fly on top of the track in friction free state.

This will decrease error that is caused by friction in motion experiment, therefore the acquired experiment data will be close to the theoretical calculation.
Flying glider, the glider floats 0.1 mm from the rail surface.



The float of glider in the picture is not to scale, actual float ± 0.10 mm.

Timer Counter System

This apparatus consists of photogates and a timer counter which is able to accurately determine the time interval when the glider passes through the photogates. Timer counter system makes it possible to do all of time measuring in an experiment such as time measuring in two different places on the track and time measuring on events which are nearly at the same time like in a collision experiment.

- **Air Track**

There are two size choices, the 1.5 m track in one part construction, which is used in basic experiment and the 2 m track in two parts construction, which has better stiffness and longer to gain better experiment result.

Those tracks are constructed from aluminum extrusion and have the fine straightness and flatness grade. Track faces are anodized for durability.

- milimeter and centimeter graduation in one side of the track.
- Collision bumper on the end of the track.
- Three points foot adjuster for track unit leveling.

Air Track 1,5 m & Air Track 2,0 m

Photogate

Timer Counter ESP T-02

- **Photogate and Timer Counter**

Timer counter available choices: AT-01 and AT-02.

Timer counter has 100 micro second resolution. 2 – 4 photogates can be directly connected at the same time to the timer counter.

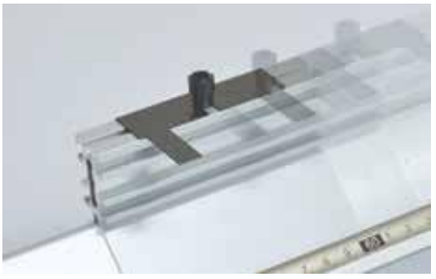
There are 7 functions on AT-01, viz.: timing I, timing II, collision, acceleration, cycles, count, and gravity acceleration.

With AT-02 velocity and acceleration can be calculated automatically, it also has electronic signal output with time interval: 0.1, 1, 10, 100 and 1000 ms.

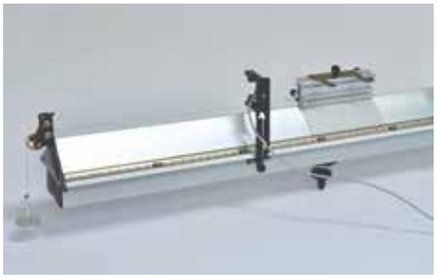
Blower A low noise blower specially designed fo EduScience Air track, equipped with 2 m elastic hose.

Experiment Topics

- Uniform Motion
- Uniform Acceleration
- Instantaneous and Average
- Velocity
- Newton's Laws of Motion
- Conservation of Momentum
- Conservation of Energy
- Simple Harmonic Motion
- Inertial and Gravitational Mass
- Explosion
- 'g' Measurement
- Friction Force Along the Track



Uniform Motion



Newton's Laws of Motion

Simple Harmonic Motion

Collision

Air Track 2 meter With Air Blower

The air track is a device to study a body in translation on a rail with two rows with holes Ø1mm. A compressed air hose, a manual launcher and two supports for optical sensors are also included in the equipment. A batch of different accessories(trolleys, pulley accelerometer, inclined plane, etc.) is also included, in a storage suitcase.
The suitcase is designed to storage also the electronic launcher for air track.
Total weight: 4kg
Rail dimensions: 85x71x1950mm
Features:
1 aluminium shaped rail 1850mm graduated
Adjustment feet included
1 compressed air hose (1.80m)
2 trolleys of 90mm
2 supports for optical sensors
Pulley accelerometer and inclined plane
Accessories batch can be used to perform the following

Main Features:

- Box in sheet metal and aluminum
- Power supply: 230V AC
- Switch for power supply
- Air flow variator
- Connection for air hose
- Air intakes and transportation handles

Experiments:

- Newton’s laws.
- Uniform and accelerated movements.
- Inclined plan.
- Elasticity & in-elasticity.
- Kinetic energy.
- AIR BLOWER FOR AIR TRACK

Advantages :

Not loud motor thanks to turbine with tangential exit. - Air input adjustable with the variator. - Powerful motor: can power supply 2 air tracks at the same time. - Easy to carry thanks to handle

ESP59867

Timer With 2 Photo Gate

White metallic box with 4 rubber feet
Board with seconds, 1/10, 1/100, 1/1000
START and STOP manual or with sensors
USB port
Power supply: 12V (included)
Dimensions: 170 x 110 x 50 mm
Weight: 550 g
Pair of optical sensors:
H-shape supports with clamping screw and optical cell
Dimensions: 100 x 85 x 20 mm
Weight: 230 g
Packaging: individual box (chroNOmeter + optical sensors)
Advantages:
Mechanics experiments optimised with the optical sensors and USB port.
ErgoNOmic product: easy reading thanks to the board inclination.
Stability with the 4 rubber feet.
Useful compactness for storage.
can be used with Air track ESP59867 , Free fall , Circular motions ...et

ESP59870

Air Track1.5 M Complete Set II

- High-pressure compressed air is discharged into a small hole on the track to move the glider (on the track) Equipment.
- You can make frictionless movement by adjusting the air on the top of the slide.
- Experiments without friction losses such as momentum conservation, equivalent speed motion, and one-dimensional collision can be performed.
- Optional: Photo gate timer Sliding track: aluminium tube 45x45mmx1.5m, 4 levelling screws Track cart: 200mm 2 pieces (with elastic plate) pulley unit: Includes weights, threads, springs, etc. Blower : AC220V 60Hz 1000W | Optional : 1. Track cart (100mm) - 2. Photo gate timer

Timer For Air Track Set II

ESP59861

• Used to measure short (fast) times in velocity, acceleration or gravity acceleration experiments of falling motion. • It can measure from 0.001 second to 60 minutes and can start, stop, mid-time (LAP), and resume (RESET). • By using a separate optical sensor, you can measure the movement time of a moving Object. PLUS 2 sets Photo Gate wit clamp for fixing and 1 meter wire • Ancillary equipment for stopwatch • It is a sort of electronic switch that electrically activates the start and stop switches of the stopwatch by detecting objects moving at high speed. • The section speed of falling motion, constant velocity, acceleration, etc. can be measured with an error range of 15us. • Mounting can be installed at all angles of vertical and horizontal, and upper and lower sections of falling motion can be installed.

ESP59871

Kinetic Theory Model I

To study the motion and behaviour of gas molecule, works on 9 to 12V DC, vibrates a small platform inside a transparent tube, which further vibrates steel balls inside the tube. Includes steel balls and two floats.

ESP59872

Kinetic Theory Model II

To study the motion and behaviour of gas molecule, works on 9 to 12V DC, vibrates a small platform inside a transparent tube, which further vibrates steel balls inside the tube. Includes steel balls and two floats.

ESP59874

Pellets For Kinetic Theory Model Ii

ESP59875

NEW

Force Table

ESP59878

Junior High School

Senior High School

- The force table is a circular table equipped with an angle scale of 0o - 360o on it. As a force component, three sets of slotted and suspended loads and three table pulleys are used to facilitate the displacement of the force. The load is attached to the thread connected by a lightweight plastic ring so that it does not overload the system and is easy to adjust.
- With force table, teachers can demonstrate that force is a vector quantity, which has a value and a direction. It also can be used to show the summation of forces quantitatively (resultant force).

Component List

Cat. code	Component	Description	Qty
ESP00848	Force Table	Used as a force resultant observation table. Equipped with a scale of 0o - 360o.	1 pc
ESP00849	Table Pulley	Used as a load bearing and force direction control. The slope of the pulley can be adjusted as needed. Pulley diameter: 5 cm Material: plastic	3 sets
ESP00850	Slotted Masses and Hanger	Used as force/load source. The total mass of the loads: 250 g Consist of 6 weights: 1 x 10 g, 2 x 20 g, 3 x 50 g, 1 x hanger 50 g.	3 sets
ESP00851	Nylon Thread with hook	Used as a load hanger, attached to a plastic ring. Length: 30 cm.	3 sets
ESP00852	Plastic ring	Used as a load bearing. Diameter: 5 cm Material: plastic	1 pc

Force Table

For verifying laws of composition and resolution of forces, comprising machined aluminium table 40cm dia., Scale graduated 360 °, on heavy vertical support rod and tripod base. Complete with one ring, 4 sliding clamp pulleys. Supplied with four cords with rings at one end, with set of slotted masses.

ESP59876

Force Table Deluxe

The classic table for studying a combination of forces! A steel support tube, cast legs, levelling screws, and a laminated table top make this unit very stable and highly functional for the study of equilibrium of force. Table Diameter 400 mm It is supplied with 4 sets slotted weights: 50g x1, 20g x9, 10g x1, 5g x2 |4pcs pulley with clamps 4pcs wires | 1pc transparent protractor, and instructions.

ESP59877

Pulley Multi-purpose

Aluminium pulley, 70mm dia. In metal bracket with two clamping screws for bench and rod support respectively. The bracket may be clamped to a board or bench edge up to 38mm thick, screwed to a flat surface or held in a 13mm diameter support rod.

ESP59885

Pulley With Clamp Super

Upgrade your force table and inclined plane experiments. The Super Pulley, with its integral clamp, makes set-up and alignment easy. The pulley height is fully adjustable, so you can skim the top of a force table for parallax-free readings, yet keep the force parallel to the track on an inclined plane as shown in the photo. Fits tables from 0 to 2.0 cm thick.

ESP59889

Pulley With Table Clamp

5cm dia., Plastic pulley mounted on a 23.5cm long metal shaft with a table clamp. Pulley shaft is held in table clamp with a clamping screw.

ESP59883

Pulley Table Clamp

Smooth running, ball bearing clamp pulley, can be clamped to surfaces up to 50mm thick and the 45mm diameter sheave is made of nylon.

ESP59887

NEW

Pulley Single With 2 Hook
DIA 50 mm

This Aluminium Pulley Single with 2 Hook (Pulley contains a pulley with a bracket and a hook at each end) You can use pulleys as helper devices, with easy lifting force. It minimizes the force required to lit a very heavy object. Both frames and sheaves are rigid aluminium, which will stand up well to student use. A great item to have in the lab or physics classroom.

ESP59880

NEW

Pulley Double In Line
DIA 40 mm

Double pulley in one line made of Aluminum , different diameter Φ 50,40 mm , with Hooks from both side You can use pulleys as helper devices, with easy lifting force. It minimizes the force required to lit a very heavy object. Both frames and sheaves are rigid aluminium, which will stand up well to student use. A great item to have in the lab or physics classroom

ESP59881

NEW

Pulley Triply In line Aluminium
DIA 50 ,40 , 30 mm

Triply pulley in one line made of Aluminum , different diameter Φ 50,40,30 mm , with Hooks from both side You can use pulleys as helper devices, with easy lifting force. It minimizes the force required to lit a very heavy object. Both frames and sheaves are rigid aluminium, which will stand up well to student use. A great item to have in the lab or physics classroom

ESP59882

Falling Bodies Apparatus

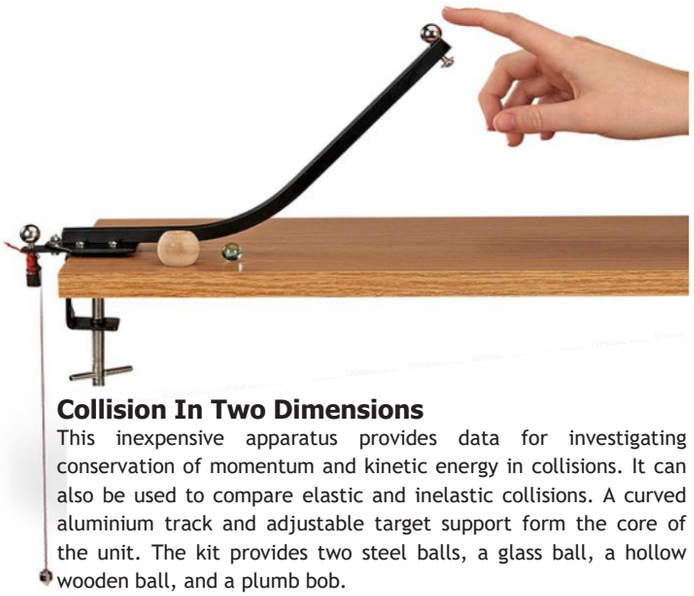
Ball shooter for illustrating the principle of independent spaces horizontal and vertical motion: The throwing motion can be seen as composed of free-fall and horizontal motion. The shooter fires one ball horizontally and the other is released in free-fall. The supplied 19 mm steel balls are stored in the device. **Dimensions :** 180 x 170 x 50 mm

ESP59895

Projectile Launcher

Projectile launcher is used for investigating the motion of projectile at different angle of projection (0-900). The angle is read by means of a plumb line that is attached to the unit. A spring loaded rod is used to project a ball (Projectile). This set up can be easily mounted on the edge of laboratory table.

ESP59898



Collision In Two Dimensions

This inexpensive apparatus provides data for investigating conservation of momentum and kinetic energy in collisions. It can also be used to compare elastic and inelastic collisions. A curved aluminium track and adjustable target support form the core of the unit. The kit provides two steel balls, a glass ball, a hollow wooden ball, and a plumb bob.

ESP59900

Pulley Demonstration Set Advanced

The Pulley Demonstration Set is designed to illustrate the working principle of simple machines. From the wheels on a bicycle to the gears in a car, the Pulley Demonstration System helps explain how things work. It helps student to understand the concepts of the mechanical advantage, the efficiency of fixed and moveable pulleys etc. Students perform quantitative experiments on fixed and moveable pulleys, trains of fixed and moveable pulleys, the wheel and axle and the capstan etc. **The set includes :**

Wooden base includes Size 81 x 20cm capstans, sockets (2) and en eye hook.

Rods 3 (Dia. 12.5mm x L 81cm), Collars with Hook 8, Right Angled Clamps 3, Wheel and Axle 1, Bar for tightening 1, Vertical Rods, Masses Slotted Weights. 2x10gm, 2x20gm, 2x50gm, 4x100gm, 4x200gm, 1x500gm Total 15 weights.

Weight Hangers. 5x50gm, 1x20gm, 1x10gm.

ESP59892

Pulley Demonstration Set Student's

Used to demonstrate the concepts of force and mechanical equilibrium. Contains a polished wooden base with a capstan mounted at one end and screw eye for hanging pulleys at the other, 24 degree vertical support rod, 8 degree crossbar with clamp, 8 single pulleys, 2 double pulleys, wheel and axle, 6 pulley clamps, 90 degree clamp, 9 hooked masses ranging from 10 to 1,000 g, pulley cord, and instructions.

ESP59893

Inclined plane, Experiments Kit

ESP59909

Junior High School
Senior High School

NEW

- Inclined Plane Experiment Kit is designed to show the correlation between the inclination of a plane and the required force for a body on top of that plane to stay still. Apart from the inclination angle, the smoothness of the contacting surface between the body and the plane also affects that required force.
- This kit consists of a plane with variably measurable inclination angle due to a protractor that is integrated to the system.
- This plane can be inclined up to 60o.
- The body that was mentioned in this kit is a friction block with four different sides that have different smoothness. The force that is required to make to body staying still is measured by using 3 N spring balance that is connected to nylon string, a pulley system, and the body itself.

Component List

Consisting of 7 components Weight: 1.760 kg.

Cat. code	Component	Description	Qty
ESP 250	Inclined Plane with Protractor	Equipped with a protractor and tilt regulator. At the end of the track there is a pulley with a diameter of 2 cm. Inclined plane board size: 550 x 190 x 30 mm. Material: Wood.	1 pc
ESP 250.01	Sliding Block I (Coated Wood and Sandpaper laminated)	Sliding block with one face covered with sandpaper and equipped with a hook at one end.	1 pc
ESP 250.02	Sliding Block II (Melamine and Glass)	Sliding block with one face covered with melamine, one face covered with glass, and have a	1 pc
ESP 51.08/09	Nylon Thread	10 m nylon thread reel.	1 pc
ESP11.14/57	Plastic Tube with Load 120 g	Plastic tube containing granules of lead bullets. Weight : 120 g.	1 pc
ESP 49/01	Balance Pan	Weight compartment that can be attached to the pulley system.	1 pc
ESP 51.10/11	Dynamometer 3.0 N	Used to measure force. The scale printed on a transparent tube. Scale : 0 - 3 N x 0.1 N Equipped with hangers on the top and hooks at the bottom for the pull load.	1 pc

NEW

Compact Ramp Kit

Dynamics on a small scale; ideal for bench top investigations with multiple groups. The kit contains 5 ramps, 5 stands, 5 blocks, 5 cars and a pack of 5 different surfaces. The ramps are 650 x 60mm and the ingenious stands give simple height adjustment from zero to 250mm in 10 steps. The blocks have a central pin to take slotted masses for varying the load. Use for investigations into motion and friction. Replacement surfaces are also available, as a pack of 5 assorted surfaces.

ESP59903

Friction Apparatus

This set includes a friction block and a friction board, both made of smoothly finished pine wood. The friction block has a hook for spring scale and two compartments for additional weights. It can be placed face-up or sideways. Students can vary the weight or area of contact to see their impact on the friction force. Comes with three 50 g weights and a 100 g spring scale. Size of board: 20 in. x 2 in. **Size of block** : 4 in. x 1-1/2 in. x 1 in. Grade 6-college.

ESP59904

Friction Board Apparatus

To demonstrate conversion of energy, conservation of momentum projectile motion. Consists of a metal ball track to drop a steel ball. Includes two steel balls. Approx. 50cm Having provision for adjustable height which can measure degree on graduated metal scale with plumb line on metal base.

ESP59906

Inclined Plan and Friction Board

Use this device to study the friction between two surfaces and the forces on an inclined plane. The inclined board can be set at any angle between 0° and 45°. A hanging pan is provided to hold the desired weight. Three different-sized boards with eye hooks and a metal plate are included. Students can determine the coefficient of static friction and the coefficient of sliding friction and verify the normal and frictional components of the force exerted by the plane. Activity manual included. 26 in. x 15 in. x 4 in.

ESP59908

Inclined Plane, Complete Set Demonstration

For experiments on static, dynamic and rolling friction; Surfaces: Wood, rubber, leather and abrasive paper
Wooden area can be doubled when opening the body.
Dimensions : 40 x 40 x 160 mm Mass: approx. 200 g

ESP59910

Collision Balls (Newtons Cradle)

This economy apparatus demonstrates elastic collision well. Features a steel frame supporting five steel supporting five steel balls on tough nylon mono-filament. Completely assembled.

ESP59902

Impact Testing Apparatus

oAn experimental device that measures the distance the wooden block moves by hitting a steel ball against a wooden block depending on the height of the rail. Investigating potential energy experiments (objects at heights have energy). One-touch height adjustment function (8 levels). The rail is made of Al and has a smooth slope, so reproducibility is good and precise practice is possible.
Dimensions: 1000100*250mm
*Exercise weight : 1 each large and small, 2-stage adjustable

ESP59916

Friction Block, Multifunctional, 40X40X160 mm

For experiments on static, dynamic and rolling friction Surfaces: Wood, rubber, leather and abrasive paper Wooden area can be doubled when opening the body.
Dimensions : 40 x 40 x 160 mm - Mass: approx. 200 g.

ESP59911

Wooden Block

Polished surface on all sides
Dimensions : 40 X 70 X 150 mm.

ESP59912

Loop The Loop Apparatus

This unit demonstrates the transformation between kinetic and potential energies when a steel ball runs on the 52 in. Looped aluminium track. 8 in. dia. loop. Track is mounted on a 11-1/2 in. x 4 in. Sturdy wood base. Attached basket safely catches ball. Includes two chrome plated steel balls. One-year warranty. Grade 12 and up.

ESP59913

Loop The Loop, Advanced

To demonstrate conversion of energy, conservation of momentum projectile motion. Consists of a metal ball track to drop a steel ball. Includes two steel balls. Approx. 50cm Having provision for adjustable height which can measure degree on graduated metal scale with plumb line on metal base.

ESP59914

Steam Engine With Boiler

Working model, with boiler, safety valve, whistle, steam chamber and flywheel, on base, to drive dynamo models etc.

ESP59936

Thermoelectric Generator

This thermo electric generator demonstrates how heat energy can be converted directly into electrical energy , by placing one of the leg into hot water and the other one into cold water then enough electrical energy is generated to power the electric motor and turn the propeller.

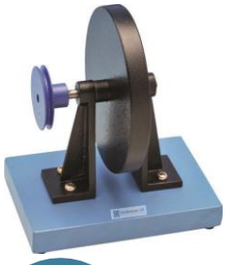
ESP59942

NEW

Energy Transfer Apparatus Line Shaft

Comprises a steel shaft which carries a clock spring with a free¬wheel device and winding ratchet, also an Aluminium 'V' pulley 56 mm dia. One end of the shaft overhangs the base for use as a line shaft when winding up a weight. For showing potential energy in a wound-up spring and its conversion to electrical energy by driving a dynamo and lighting a lamp. May also be used to wind up a weight on a cord showing the change from potential energy to kinetic and back to potential in the raised weight. The steel shaft carries a clock spring with a free wheel device and winding ratchet, also an aluminium 'V' pulley 56 mm diameter. One end of the shaft overhangs the base for use as line shaft when winding up a weight. Dimensions 220 x 100 x 100 mm high. Size 10 x 20 cm

ESP59928



Flywheel Unit

Steel fly wheel 100 mm diam. with pulley 20 mm diam. on shaft held in brackets, mounted on base.

ESP59935

Steam Generator

Seamless, lll-aluminum construction Will not collapse even if boiled dry Durable walls are 1.5mm Thick All parts are of the same alloy, keeping corrosion to a minimum Boiler with cap, nipple, sample cup with wooden handle, two no. 8 rubber stoppers (one with hole for thermometer), tripod stand and ring, instructions

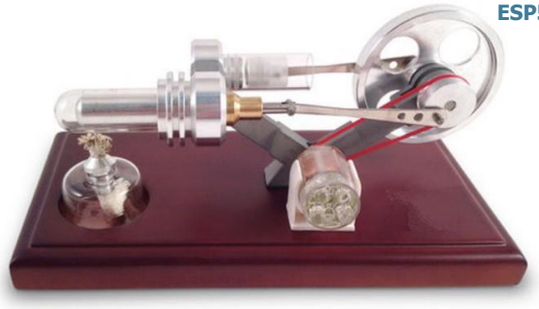
ESP59938

NEW

Hydraulic Brake Model

Hydraulic Brake : Bench mounted Particularly suitable for motor vehicle teaching Comparison of leading and trailing shoes Determination of coefficient of friction Simulates real brake drum

ESP59921



Stirling Engine Generator

This Stirling Engine Model is a unique heat engine to show students how thermal expansion and cold shrinkage can create energy. The compact, easy-to-use engine model uses a closed-cycle thermodynamic system in which air is compressed and expanded at different temperatures to create heat energy. You see it working as the generator gains speed and begins to power LED lights.

ESP59940

Stirling Engine Model Transparent

Overhead functioning models (OFM)

For demonstrating the movements involved in heat engines and explaining how they work using an overhead projector, acrylic model with coloured parts, including drive shaft,

Base panel : 248x248 mm.

ESP59941

Energy Transfer Apparatus Hand wheel Driving Unit

75 mm dia. Driving and output pulleys with 20 mm dia. Intermediate pulley is fiited on 16 x 16 cm base.

For use in driving dynamos, line shafts, flywheels, pumps etc. The driving and output pulleys are both 75 mm diameter and the intermediate pulley is 20 mm diameter giving a step-up ratio of 3.75 Size 16 x 16 cm

ESP59933

Energy Transfer Apparatus Spring Unit

Comprises a steel shaft which carries a clock spring with a free¬wheel device and winding ratchet, also an Aluminium 'V' pulley 56 mm dia. One end of the shaft overhangs the base for use as a line shaft when winding up a weight.

For showing potential energy in a wound-up spring and its conversion to electrical energy by driving a dynamo and lighting a lamp. May also be used to wind up a weight on a cord showing the change from potential energy to kinetic and back to potential in the raised weight. The steel shaft carries a clock spring with a free wheel device and winding ratchet, also an aluminium 'V' pulley 56 mm diameter. One end of the shaft overhangs the base for use as line shaft when winding up a weight. Dimensions 220 x 100 x 100 mm high. Size 10 x 20 cm

ESP59934

Small Motor

1.5 - 4.5V D.C. motor provided with 15 mm diameter 'V? pulley. Mounted on base with 4mm socket terminals. Use in conjunction with motot , Base size is 4x6" The Malvern Energy Transfer Kit is comprised of a number of separately available units which enable the user to qualitatively show energy conversion from one form to another in a variety of different ways. All units are carried on a base and provided with 4 mm socket terminals where appropriate. For use as a driving unit /dynamo. Comprises 1.5 - 4.5V D.C. motor provided with 15 mm diameter 'V? pulley.

ESP59929

Energy Transfer Apparatus Large Motor

Mounted driving unit or dynamo - 6V DC motor and 15mm V pulley ; Mounted on base with 4mm terminal socket Great for use as a tool for studying the input/output of larger motors on a comparative level Base size is 15X10cm

ESP59930

Energy Transfer Apparatus Mounted Lamp

includes 12v-24w bulb mounted to baes , pair of 4 mm sockets to tie into solar cell

ESP59931

Energy Transfer Apparatus Lamp unit set

consists of three bulb holders connected in parallel with two 4mm sockets, mounted on a standard base. Complete with bulbs.

For use with motor / generators to give an indication of their output when used as dynamos. The lamp holders are connected in parallel. Supplied with three lamps 3.5 V, 0.25 Amps. M.E.S

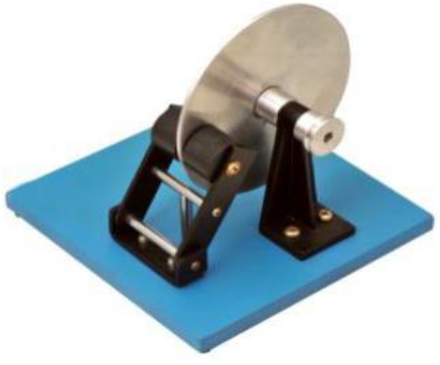
ESP59932

Energy Transfer Apparatus Turbine

Comprises a rotor housed chamber and a clear perspex front. Two inlet tubules (one each for turbine and pump operation) and one outlet are provided. The shaft has 20 mm diameter pulley. For use as a water turbine to drive a generator producing electricity or for use as a pump driven by a motor and raising a head of water to produce potential energy. The rotor has eight 'bucket' blades and is housed in a block turbine chamber 50 x 50 x 25 mm with a clear perspex front. Two inlet tubules (for turbine and pump operation respectively) and one outlet tubule are provided, and the shaft carries a 15mm diameter pulley.

Size 15 x 10 cm

ESP59949



Energy transfer Apparatus Eddy Current Unit

Eddy current unit Eddy Current Unit for the

demonstration of eddy current braking when used in conjunction with the hand wheel driving unit.

Aluminum disc has a 4.5" diameter and has a 20mm driving pulley. The powerful circular magnets are mounted on a pivoted arm so that they may; be moved over or away from the disc as required. The apparatus is mounted on a secure wooden base. The base has rubber ; stoppers underneath to prevent the apparatus from moving or sliding on the surface while in use.

The apparatus stands 6.5" tall, 7" long, and 4.6" wida weight. Dimensions 220 x 100 x 100 mm high. Size 10 x 20 cm

ESP59951

Energy Transfer Apparatus Water Unit

"Unit consists of two basins and shaped glass tubes as shown in figure. Supplied on stand and used with turbine/pump unit.For use with turbine pump unit to provide an open or closed system in demonstrating the conversion from electrical to kinetic energy in the pump and potential energy in the head of water. Supplied complete with two basins 80 mm diameter and shaped glass tubes. The upper platform has 38 mm diameter hole to allow use as a simple recirculation system with a single reservoir."

ESP59954

Eddy current (Waltenhof) pendulum

For demonstrating eddy currents and Lenz‘s rule, simple, fast and safe; the slotted pendulum plate swings un braked by the magnetic field, where as the full pendulum plate is strongly decelerated; Boom made of robust steel, powder-coated, axle bearing for the pendulum plates at the top, strong magnetic field at the botom due to two neodymium magnets.3 pendulum plates made of aluminium, 1 x solid, 1 x perforated, 1 x slotted Pendulum plates: 290 x 80 x 3 mm Boom: 120 x 100 x 310 mm Total weight: approx. 1683 g

ESP59956

Hydro Electric Power Station

This Hydro-electric power generator is composed of a well made turbine with transparent cover connected to a small motor to generate electricity. Ideal for classroom demonstrations, students can directly observe the process of conversion of water flow to electrical energy that occurs in hydro-electric power plants.

ESP59953

NEW

Pelton turbine demo, with generator

To demonstrate the conversion of mechanical energy into electrical energy; Low friction blade wheel in acrylic glass housing, Axle with large drive wheel and drive belt to a fied housing with generator and two 4 mm safety jacks, Side inlet opening for a water hose, Base plate with outlet opening, can be mounted on the tank using drain connector. Blade wheel diameter = approx. 145 mm; dimensions: approx. 200 x 80 x 235 mm

ESP59945

Wind Turbine

"Large working model of a wind turbine, to demonstrate the conversion of wind power into electrical energy; DC generator with hub to accommodate up to 6 rotor blades, 3, 4 or 6 rotor blades can be attached, stable stand base with metal inlay, voltage is taken from two 2 mm sockets, 2 cables L=25 cm, each with a 2 mm and a 4 mm plug, rotor blade: 160 x 30 mm blade-L= 160 mm height incl. rotor blades=430 mm Base plate D=130 mm hub height=260 mm weight=335 g"

NEW

ESP59945

Thermal generator with clamp

For conversion of thermal energy into electrical energy or vice versa; acrylic housing with centrally arranged Peltier element between two cubic aluminium containers, fixed upright section with 2 safety jacks and holders for thermometers, clamp for fastening the aluminium containers to the Peltier element,

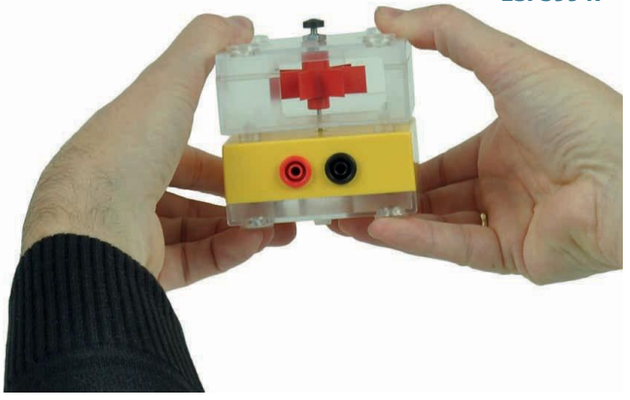
Peltier element : Max. 15 V / 3.5 A ; Aluminium container : 50 ml each Dimensions : 85 x 55 x 80 mm

ESP59943

Turbine Model

To show conversion of mechanical energy into electrical energy. Turbine with transparent cover, inlet and outlet tubes directly connected to a dynamo. Fitted on base.

ESP59947



Turbine Model With Motor/ / Generator

Easy-to-turn motor (solar motor) with long shaft for attaching a Pelton turbine , supplied with transparent Pelton Turbine unit
4 holes on top for locking the Pelton turbine; two 4 mm safety jacks on side;ready to go at just 200 mV / 20 - 30 mA; Magnetic housing with transparent base plate;
Dimensions : 84 x 84 x 39 mm.

ESP59948

Eddy Current Apparatus

Effective device for demonstrating Lenz's law using eddy currents induced in the wall of a copper tube by a falling magnet. Two identical metal slugs with rubber ends caps, one is made of plain steel, and the other is a strong neodymium magnet. Kit also includes an activity guide.

ESP59950

Wind Generator

Renewable energy is all around us. Learn about wind power, how to harness, young scientists will be excited about wind energy.

ESP59944

Motor Generator AC/DC Demo. Activity Model

An excellent activity model for study of the generation of electric current. The generator produces AC/DC current simultaneously when the hand wheel is turned. The generation of the AC/DC voltage is represented by

bulbs. Output is through 4 mm sockets and a low voltage bulb is also provided as a simple output indicator.

ESP59955

Solar Powered Car

Explore green energy on a small scale! This solar car operates on sunlight or a rechargeable AA battery. A four-position switch allows you to choose between running the car on the solar cell or battery, recharging the battery from the solar cell, or off. The car can also operate using a strong lamp. Measures 4-3/4 in. L x 2-3/4 in. W x 3 in. H.

ESP59965

Solar Energy Kit, Wooden Box

To demonstrate the effect of solar power in various devices, Each component in this kit connects to the solar cell. The kit includes a mounted solar cell with terminals, a motor, a LED, a rechargeable battery and an ammeter mounted on a base. Housed in a fine Wooden box. With instructions.

ESP59958

Solar Combination Unit

Mounted on a Plastic base size 350 x 90 x 20mm approx. A mains 60W bulb fitted on Screw type holder. Supplied with compatible Solar Cell which further gives energy together to a Low Voltage Speaker and Low Voltage Motor fitted with Color Newton Disc.

ESP59961

Hand Generator (Flashlight)

This generator can be utilized with almost any experiment requiring up to 12V DC current. Housed in tough clear plastic, this unit is not only functional, but costs about half that of similar models. Can also be used as a hand-generated flashlight due to the mounted lamp on the end or use the binding post to connect an outside electrical circuit. Pistol-grip handle. Grades K-12.

ESP59952

Solar Energy Kit Combined

Apply knowledge of solar energy in a practical experiment with this Solar Energy Kit. A solar panel housed in a metal stand, a low consumption motor with fan, a buzzer and an LED are all included for conducing a series of solar powered activities.

ESP59957

Motor Mounted For Solar Cell

This is a small low consumption electric motor on a base specially designed to run directly from the output of the solar cell and to illustrate the direct conversion of light energy to electrical and hence to mechanical.

ESP59962

Solar Cell Mounted

For use with the motor to demonstrate the production of electrical energy directly from light energy. The apparatus comprises a selenium photo-voltaic cell.

ESP59963

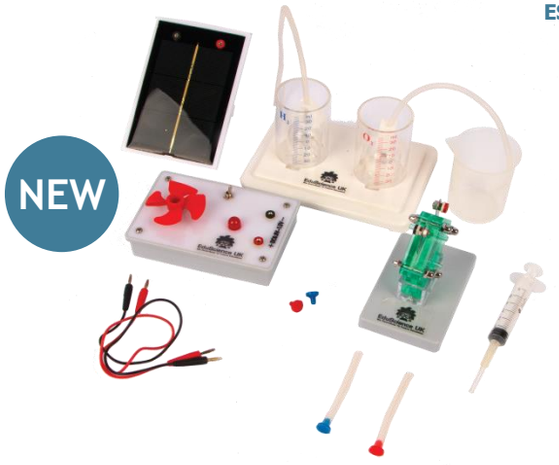
Solar Cell

This apparatus is design for observation on solar energy become motion, sound and light energy

Complete with a VOLTMETER to measure the voltage value from the solar cell and ammeter to measure the current value from the solar cell

Dimensions : 32.50 (L) x 26.50 (W) x 14.00cm (H)

ESP59964



Solar Hydrogen Education Kit Economy

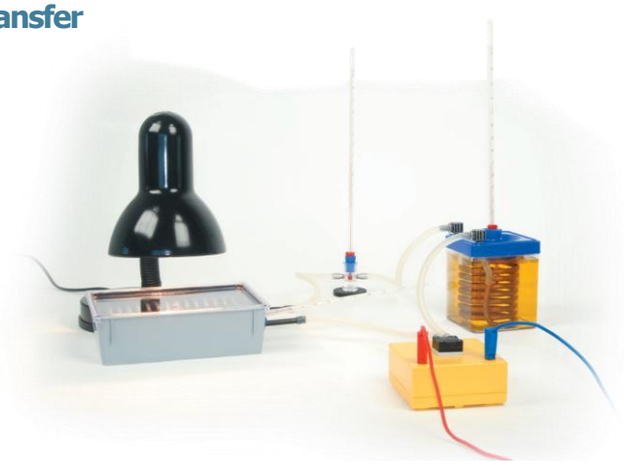
consist of the Following :1.Drainage and gas storage device: two 70ml cups, with a transparent cup with a ""0"" scale of 35ml above and below, clamped on a 150mm*105mm*15mm base, marked with H2 and O2 respectively2.Platinum-Carbon Proton Exchange membrane hydroelectricity generation dual-use module (renewable battery) two-sided diamond reaction window, 2.5*2.5c m̊,base size:89mm*64mm*12mm3.LED & Fans can choose by a switch4.Solar Panel size : 87mm*127.5mm

ESP59967SP

Solar Hydrogen Education Kit

Explore series and parallel circuits and other physics concepts with renewable energy power from a fuel cell and solar panel. Use the power of the sun to split water and generate hydrogen gas while learning about chemistry concepts.

ESP59967



Student Hot Water Kit

Complete working model of a solar unit; the water circulation is very clearly shown and is therefore easy to understand; temperatures measured in the collector, the heat exchanger and the flow system. t consisting of:

1x Solar collector ES, 1x Heat exchanger ES,
1x Pyrometry chamber
1x Circulating membrane pump
Self-absorbing
Low noise level
Minimal power consumption
Low weight
Small housing
Less vibrating
Supply voltage: 2 ... 12 V DC Max.
Power input: 20 ... 150 mA Free
flow rate: 150 ml / min Max.
Pressure: 6.0 m (water)
Max. Static suction lift: - 3.0 m (water) 2
tube connectors dia. (Ext.) = 4.8 mm
Installed in magnetic housing: 84 x 84 x 39 mm
3x Laboratory thermometer -10 ... +110 / 1 °C 4x
Tubing silicone, D = 3 / 6 mm, L = 24 cm
1x Syringe 120 ml, plastic
Storage:
1x Box insert Hot water
1x Storage box II small, with cover
Box-insert plan with 2 label

ESP59968

Fuel Cell Science Kit

Investigate the science behind salt water fuel cell technology, either by powering the included mini-turbine or creating your own power applications. Features a magnesium salt-water fuel cell, teaching students how solution concentration can affect reaction rates using electricity and a salt-water electrochemical cell. Experiment with the electro-chemistry process and measure the output of your generator.

ESP59969

Alternative Energy - Conversion, KIT

With the module Alternative energy-conversion experiments to the Following topics can be performed:

1. Making energy feelable (9 Experiments)
2. Wind Power (3 Experiments)
3. Thermal Power (3 Experiments)
4. Hydro Power (2 Experiments)
5. Energy and temperature (2 Experiments)
6. Sun - Photovoltaic (4 Experiments)
7. Fuel cell (3 Experiments)
8. Energy storage (3 Experiments)

9.ESP59972

Renewable Energy Eduction Kit

Full PBL unit on clean power generation includes an exploration of the environmental effects of atmospheric carbon dioxide. Hands-on activities centre on complementary attributes of different renewable energy sources. Complete student and teacher materials for up to 10 class periods of activities. For 3-4 students.

ESP59971

Alternative Energy - conversion student kit

Kit consisting of:
1x Fire piston, 1x Ignition cylinder, 1x MBC double solar cell, 1x Clinometer for double solar cell, 1x Electric car, model, 1x Turbine in casing, 1x Motor/ generator, 1x Propeller, 1x Hand generator , 1x Energy storage, 1x lamp socket E 10, 5x Light bulb, 1.5 V/50 mA, E10, 1x Set of 6 cables, ES Storage:
1x Box insert Alternative energy -
conversion 1x Storage box II big, with
cover,
Box -insert plan with 2 labels

ESP59970

NEW

Renewable Energy Education Kit Economy

Consist of the Following : 1.Battery Holder, base size : 9mm*64mm*12mm2.Drainage and Gas Storage device: two 70ml cups, with a transparent cup with a ""0"" scale of 35ml above and below, clamped on a 50mm*105mm*15mm base, marked with H2 and O2 respectively3.Platinum-Carbon Proton Exchange Membrane hydroelectricity generation dual-use module (renewable battery) two-sided diamond reaction window, 2.5*2.5cm², base Size:89mm*64mm*12mm4.LED & Fans can choose by a switch5.Solar Plate size : 87mm*127.5mm6.Wind Generation Model : overall height 275mm, with 6 pcs fan blades.

ESP59971SP

Petrol Engine Model Tow Stroke

Showing internal structure and operating principles of a simple piston air cooled two stroke engine, Mounted on a metal base with schematic diagram.
Overall Height 360 mm approx.

ESP59973

Two-Stroke Engine, Transparent Model

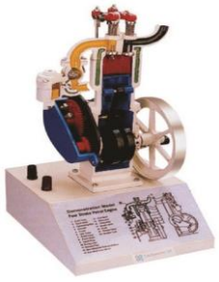
Overhead functioning model (OFM)
For demonstrating the movements involved in heat engines and explaining.
how they work using an overhead projector;
acrylic model with coloured parts, including drive shaft.
Base Panel : 248 x 248 mm

ESP59974

Petrol Engine Model Four Stroke

Air cooled, four stroke, with operation of valves clearly shown. Mounted on a metal base with schematic diagram
Overall Height 450 mm approx.

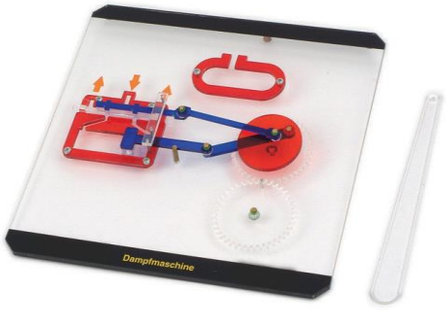
ESP59975



Diesel Engine Model Tow Stroke

A model of two stroke diesel engine made in aluminium and unbreakable plastic. Ignition is shown by means of a miniature bulb. Fuel supply is also sectioned. With hand crack, provided for manual operation.

ESP59977



Steam engine, Transparent model

Overhead functioning model (OFM) For demonstrating the movements involved in heat engines and explaining, how they work using an overhead projector; acrylic model with coloured parts, including drive shaft.
Base Panel : 248 x 248 mm

ESP59982

Diesel Engine Model Four Stroke

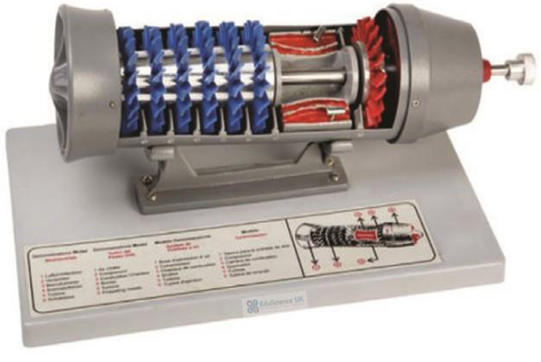
Four stroke water cooled diesel engine, shows functioning of fuel injection system together with hot coil starting device.

ESP59979

Diesel Engine Model Four Stroke Transparent

Overhead functioning model (OFM)
For demonstrating the movements involved in heat engines and explaining, how they work using an overhead projector; acrylic model with coloured parts, including drive shaft;
Base Panel : 248 x 248 mm

ESP59980



Gas Turbine / Turbojet Engine Model

Constructed by light but strong metal, fixed on a plastic base. All major parts like intake, double stage compressor, fuel supply, axial flow, combustion chamber, turbine rotar, exhaust and jet thrust etc. are shown in the model. Cross sectional view with key card is printed on the base.

ESP59981

Four-Stroke Engine, Transparent Model

Overhead functioning model (OFM)
For demonstrating the movements involved in heat engines and explaining,
how they work using an overhead projector;
acrylic model with coloured parts, including drive shaft;
Base Panel : 248 x 248 mm

ESP59976

GEAR & DRIVE KIT 3D

NEW

SET / 11 DIFFERENT TYPE INCLUDES : Crank slider drive Worm gear drive Cam mechanism Gear drive Double crank mechanism Chain drive Crank rocker drive Gear drive Bevel gear drive Rack and pinion drive Crank rocker drive Belt drive

Set contain 11 different models that can be disassembled all details are showing in 3 dimension , all components made of sturdy plastic

ESP60041

NEW

GEAR & DRIVE KIT 2D

SET / 8 DIFFERENT TYPE

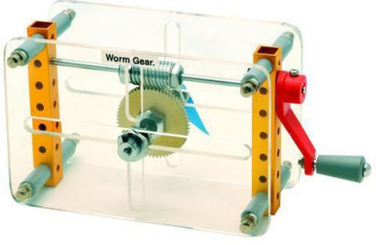
The experiment box is equipped with a device list, and the equipment is taken according to the list number. The high quality PP material is used. Non-toxic and tasteless.

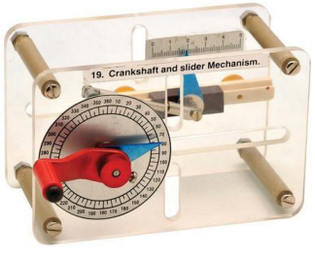
Piston drive model , Worm gear drive model , Timing belt drive model

Rack and pinion drive model , Straight gear transmission model

Friction wheel drive model , Belt drive model , Sprocket drive model

ESP60042





Mechanical Training Modules

ESP59983	Single stage spur gear
ESP59984	Single stage spur gear with intermediate gear
ESP59985	Tow stage spur gear
ESP59986	Three stage spur gear
ESP59987	Three speed and reverse gear
ESP59988	Worm gear
ESP59989	Bevel gear
ESP59990	Rack and quadrant gear drive
ESP59991	Reversing gear, tumbler type
ESP59992	Epicyclic gear (sun and planet)
ESP59993	Cycloidal motion
ESP59994	Internal rolling gear drive
ESP59995	Internal gear and pinion drive
ESP59996	Helical gear
ESP59997	Spiral gear 90 degree
ESP59998	Spiral gear single stage with intermediate gear
ESP59999	Herringbone gear
ESP60000	Crank drive to oscillating link
ESP60001	Crank shaft & slider mechanism
ESP60002	Tow crank and linkage drive (variable velocity)
ESP60003	Crank and slotted link drive (oscillator)
ESP60004	Crank and slotted link drive (variable velocity)
ESP60005	Friction wheel drive circumference
ESP60006	Cone clutch drive (single sided)
ESP60007	Cone clutch drive (tow speed)
ESP60008	Dog clutch drive (single sided)
ESP60009	Dog clutch drive (tow speed)
ESP60010	Flat belt drive (with tensioners)
ESP60011	Belt drive toothed
ESP60012	Belt drive single speed
ESP60013	Belt drive tow stage
ESP60014	Belt drive (contra rotation)
ESP60015	Belt drive multi speed
ESP60016	Chain drive with tensioner
ESP60017	Geneva drive (Maltese cross) output
ESP60018	Sliding wedge gear with straight line & accurate
ESP60019	Cam with straight line and lever follower
ESP60020	Face cam drive (free follower)
ESP60021	Mechanical training modules -face cam drive (double sided trapped f)
ESP60022	Oldham coupling
ESP60023	Differential gear
ESP60024	Lathe screw cutting
ESP60025	Shaper model
ESP60026	Crank and connecting rod
ESP60027	Four bar link mechanism
ESP60028	Bevel gear type reversing mechanism
ESP60029	Scotch yoke mechanism
ESP60030	Ellipse tracer
ESP60031	Watt mechanism
ESP60032	Peaucellier linkage drive
ESP60033	Pantograph mechanism
ESP60034	Allen link motion
ESP60035	Hobbing
ESP60036	Centrifugal mechanism and clutch drive
ESP60037	Friction wheel drive (variable speed)
ESP60038	Crank and slotted link drive - oscillator

Dynamometer 2 N, With Round Dial

Thanks to a very precise torsion spring, this dynamometer shows the correct value in all pull directions, not only vertically; due to the large scale, the displayed value can be seen from a distance, making this device is highly recommendable as a demonstration measuring device; torsion spring dynamometer with a rotatable pulley with a deep notch; easily visible red metal pointer; thanks to the rotatable metal scale the zero point can be quickly and easily adjusted; hooked cord for suspending objects; with support rod D = 10 mm, L = 30 mm;
Measuring Accuracy : approx. ±3%; **Digit height on Scale :** 15 mm; Diameter of scale : 200 mm

ESP60044

Dynamometer 5 N, With Round Dial

Thanks to a very precise torsion spring, this dynamometer shows the correct value in all pull directions, not only vertically; due to the large scale, the displayed value can be seen from a distance, making this device is highly recommendable as a demonstration measuring device; torsion spring dynamometer with a rotatable pulley with a deep notch; easily visible red metal pointer; thanks to the rotatable metal scale the zero point can be quickly and easily adjusted; hooked cord for suspending objects; with support rod D = 10 mm, L = 30 mm;
Measuring Accuracy : approx. ±3%; **Digit Height On Scale :** 15 mm; **Diameter of scale :** 200 mm

ESP60045

Dynamometer 10 N, With Round Dial

Thanks to a very precise torsion spring, this dynamometer shows the correct value in all pull directions, not only vertically; due to the large scale, the displayed value can be seen from a distance, making this device is highly recommendable as a demonstration measuring device; torsion spring dynamometer with a rotatable pulley with a deep notch; easily visible red metal pointer; thanks to the rotatable metal scale the zero point can be quickly and easily adjusted; hooked cord for suspending objects; with support rod D = 10 mm, L = 30 mm;
Measuring Accuracy : approx. ±3%; **Digit Height On Scale :** 15 mm; **Diameter of scale :** 200 mm

ESP60046

Dynamometer 1 N, With Round Dial

Thanks to a very precise torsion spring, this dynamometer shows the correct value in all pull directions, not only vertically; due to the large scale, the displayed value can be seen from a distance, making this device is highly recommendable as a demonstration measuring device; torsion spring dynamometer with a rotatable pulley with a deep notch; easily visible red metal pointer; thanks to the rotatable metal scale the zero point can be quickly and easily adjusted; hooked cord for suspending objects; with support rod D = 10 mm, L = 30 mm; **Measuring Accuracy :** approx. ±3%; **Digit height on Scale :** 15 mm; **Diameter Of Scale** : 200 mm

ESP60043

Lever Demonstration

Comprises of Approximately 50cm metal rule drilled every 4cm approx. or supplied with a movable rider. A set of suitable weights with hooks. A metallic base and stand to fix the liver in a fulcrum. 2 adjustable screws on the rule to adjust a fulcrum. Two pans to be able to change the lever to a simple balance. Supplied with weights packed in Plastic case.

ESP60078

Kitchen Scale

Capacity : 5000 G / 200 OZ , Sensitivity : 1 G, Display Mode : G &OZ , Key Function : ON / OFF , TAR,MODE , 1.1 LTR Container (Optional), Low Battery Indicator , Overload Indication , Auto / Manual Shut-Off , Powered by 2 X CR2032 Lithium Battery

ESP60072

Newton Meter

Newton meters,in robust plastic transparent body, overall length 285mm approx. With upper and lower suspension hooks, with zero adjustment, scales are both in grams and newtons.

ESP60047 Newton Meter, 100Gm/1N, 1Gm
ESP60048 Newton Meter, 250Gm/2.5N, 5Gm
ESP60049 Newton Meter, 500Gm/5N, 10Gm
ESP60050 Newton Meter, 1Kg/10N, 20Gm
ESP60051 Newton Meter, 2Kg/20N, 40Gm
ESP60052 Newton Meter, 3Kg/30N, 60Gm
ESP60053 Newton Meter, 5Kg/50N, 100Gm

Precision Dynamometer

The Precision Dynamometer is available in range of weight capacities and scales. They are incredible precise and are suitable for measuring weights, masses and forces. Each different weight capacity is color coded for ease of identification. As well as offering a high level of precision, these dynamometer are also easy to read enabling accurate readings to be taken quickly and precisely.

ESP60060 Precision dynamometer, 100gm/1n, 2gm
ESP60061 Precision dynamometer, 250gm/2.5N, 5gm
ESP60062 Precision dynamometer, 500gm/5n,10gm
ESP60063 Precision dynamometer, 1kg/10n, 20gm
ESP60064 Precision dynamometer, 2kg/20n, 40gm
ESP60065 Precision dynamometer, 3kg/30n, 60gm
ESP60066 Spring balance precision dynamometer, 5kg/50n, 100gm

force Meter

Force meter, designed to work for mass and force activity. Dual calibrated in grams and newtons.

ESP60054 Force meter, 250gm/2.5N, 5gm
ESP60055 Force meter, 500gm/5n, 10gm
ESP60056 Force meter, 1kg/10n, 20gm
ESP60057 Force meter, 2kg/20n, 40gm
ESP60058 Force meter, 3kg/30n, 60gm
ESP60059 Force meter, 5kg/50n, 100gm

Precision Dynamometer, 0,1 N

The most economic way to measure drag forces, therefore perfectly suitable for student use; accurate dynamometer with long and clearly visible Newton scale; zero-point correction; guard to prevent over- extension of the spring; the transparent case allows the functioning of the coil spring to be observed; with hooks for mounting the device and suspending weights.

Measuring Accuracy : ± 2%
Length of scale : 100 mm
Dynamometer case : L = 215
mm Reading : 0,001 N
blue coloured
Dimensions : D = 16 mm, total L = approx. 285 mm

ESP60069

Precision Dynamometer, 0,2N

The most economic way to measure drag forces, therefore perfectly suitable for student use; accurate dynamometer with long and clearly visible Newton scale; zero-point correction; guard to prevent over- extension of the spring; the transparent case allows the functioning of the coil spring to be observed; with hooks for mounting the device and suspending weights.

Measuring Accuracy : ± 2%
Length of scale : 100 mm
Dynamometer case : L = 215
mm Reading: 0,002 N
grey coloured
Dimensions : D = 16 mm, total L = approx. 285 mm

ESP60070

Springs Large Compression - Compression Springs

Large compression springs. 50 Mm approx. Long, dia 10 mm and wire of 19 SWG.

ESP60067

Springs Large Compression- Extension Springs

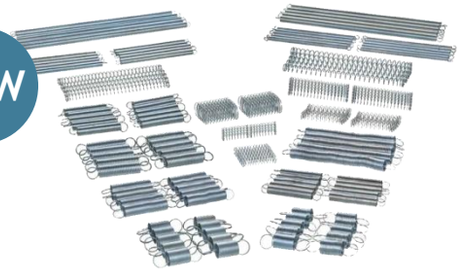
Extension springs. 50 Mm approx. Long, dia 10 mm and wire of 19 SWG.

ESP60068

ESP60073

ESP60074

NEW

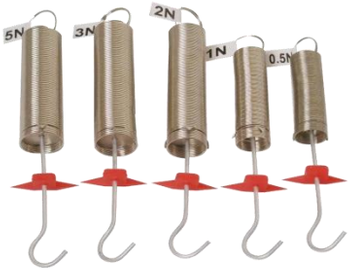


Spring Set of 150

Compression and Extension Springs; Range in Length from 15mm to 300mm ; Range in diameter from 4mm to 18mm ;Range in wire thickness from 16 s.w.g. to 32 s.w.g. The sturdy, variable sized, compression and extension springs provide the perfect tools for studying motion of mass on a spring, Hooke's Law, potential energy, etc. They provide a visually and kinesthetically effective method for studying the physics of springs

ESP60071

NEW



Spring set of 5(0.5N,1N,2N,3N,5N)

set of 5 Spring 0.5N,1N,2N,3N,5N

ESP60071/5

ESP60076

ESP60075

Hook's law

ESP60073	Hook's law apparatus	Consists of a mirror scale, 12cm long and support, a spring, a weight holder and 9 slotted weights.
ESP60074	Hook's law apparatus super	Consists of scale, 12cm long and support, a spring, a weight holder and 9 slotted weights.
ESP60075	Hooks law experiment kit	**Consist of :** Stand Base 190mm, A-shaped 1pc, Stand Rod dia. 10 c 1000mm, with thread and tap 1 set, Universal Boss-head with Short Bearing Pin 1 pc, Scale on Stand Rod 1pc, Pointer on Spring 3 pcs, Helical Spring 10 N/m 1 pc, Helical Spring 25 N/m 1 pc, Helical Spring 4.5 N/m 1 , pc, Slotted Load and Hanger 300 g (5 Loads) 1 set, Experiment Manual Book, Part of Physics Experiment Tools Package for Senior High School/Vocational School **Dimensions :** (L) 62.00 x (W) 30.00 x (H) 9.00 cm **Weight :** 4.200 kg
ESP60076	Hooks law experiment kit	**Consist of :** Stand Base and Rod, Steel plate 1 pc, Boss-head, Universal 1 pc, Bearing Pin 1 pc, Helical Spring 10 N/m 1 pc, Helical Spring 25 N/m 1 pc, Helical Spring 4.5 N/m 1 pc, Slotted Load and Hanger 250 g (6 Loads) 1 set **Dimensions :** (L) 62.00 x (W) 30.00 x (H) 9.00 cm **Weight :** 3.250 kg

Junior High School
Senior High School

Hooks law Experiment Kit

ESP60075

- Hooke Experiment Kit is designed to perform a spring constant measurement of a spiral spring. This
- measurement is possible by measuring the length difference between the unloaded and force-loaded spiral spring .
- In this kit, the mentioned force is the weight force of a known hang-able mass. Moreover, this kit also consist of special pointers that can be attached to the provided stand to simplify the spiral spring's extension.

Component List

Consisting of 9 components, packed in a plastic injection moulding box.
Dimension: 62 × 30 × 9 cm. Weight: 4.2 kg.

Cat. code	Component	Description	Qty
ESP 25/30	Stand Base 190 mm, A-Shaped	Die cast iron, equipped with locking bolt.	1 pc
ESP 30/500-02	Stand Rod Ø 10 x 1000 mm, with Thread and Tap	Stainless steel, Ø 10 mm, length 1000 mm.	1 Set
ESP 162 02	Universal Bosshead with Short Bearing Pin	Made of aluminum with a shaft length of 2 mm.	1 pc
ESP 020	Rod-Attachable Ruler	50 cm ruler that can be attached to the stand rod.	1 pc
ESP 025	Spring Pointer	Ruler pointer that can be attached to the spring.	3 pcs
ESP 51.26/39	Helical Spring 10 N/m	Has a spring constant of 10 N / m with a diameter of 1 mm. Steel material.	1 pc
ESP 51.27/40	Helical Spring 25 N/m	Has a spring constant of 25 N / m with a diameter of 1 mm. Steel material.	1 pc
ESP 100 100	Helical Spring 4.5 N/m	Has a spring constant of 4.5 N / m with a diameter of 1 mm. Steel material.	1 pc
ESP 138	Slotted Load and Hanger 300 g (5 loads)	Consists of 3 loads each with a mass of 300 g.	1 Set

Experiment Topics

E1 Hooke's Law

NEW

Demo Balance Support

The sturdy notched support is available for use the lab. materials you already have to complete the apparatus. You will need a meter stick, mass hangers and masses and several knife edge clamps, available separately. Support is 18.5 cm in height and weight is 280 g approx.

ESP60077

Balance Weight Physical

Made of Polished Brass, supplied with Wooden block, as illustrated.

ESP60079	Capacity 500gm	Comprising 1 x 200gm,2 x 100gm, 1 x 50gm, 1 x 20gm, 2 x 10gm, 1 x 5gm, 2 x 2gm, 1 x 1gm.
ESP60080	Capacity 1000gm	Comprising 1 x 500gm, 1 x 200gm, 2 x 100gm, 1 x 50gm, 1 x 20gm, 2 x 10gm, 1 x 5gm, 2 x 2gm, 1 x 1gm.
ESP60081	Capacity 2000gm	Comprising 1 x 1000gm, 1 x 500gm, 1 x 200gm, 2 x 100gm, 1 x 50gm,1 x 20gm, 2 x 10gm, 1 x 5gm, 2 x 2gm, 1 x 1gm.

Weight Set Hooked Weight

Brass with hooks on both sides. Recessed bottoms to enable the weights to be hooked together. The bottom is flat when placed on a flat surface. Set of 9 weights. 10 - 1000g in wooden block.

ESP60082

Weight Set Primary Weight

These weights are polished and lacquered Brass weight sets fitted in a durable hardwood storage box as illustrated. 1 each of 1gm, 5gm, 20gm, 100gm and two each of 2gm and 10gm

ESP60083

Slotted Masses And Hanger

Slotted Masses and Hanger , EduScience Nickel plated Brass ,mass in disc shape Material: EduScience Plated Brass **Consists of:** 1 x Masses hanger - 9 x Slotted Load

ESP60085	Total Weight 100 GR	9 x 10 g + hanger
ESP60086	Total Weight 200 GR	9 x 20 g + hanger
ESP60087	Total Weight 500 GR	9 x 50 g + hanger
ESP60088	Total Weight 1000 GR	9 x 100 g + hanger
ESP60085B	Total Weight 100 GR	9 x 10 g + hanger
ESP60086B	Total Weight 200 GR	9 x 20 g + hanger
ESP60087B	Total Weight 500 GR	9 x 50 g + hanger
ESP60088B	Total Weight 1000 GR	9 x 100 g + hanger

Slotted Masses And Hanger 12 pc 200 GR BRASS

NEW

Slotted Masses and Hanger ,
EduScience Brass ,mass in disc shape
Material: EduScience Brass
Consists of:
5g to 20g Mixed Masses and Hanger
Set of 12 brass nicked plated slotted masses with hanger 50g hanger, nine masses of 20g, one of 10g
and two of 5g.

ESP60086B12

Slotted Weight Set Of Masses And Hanger,

Set of 9 slotted masses, one hanger This improved set comprises masses of Brass with slots, brass hangers with hook. The design of the slots ensures that the masses may be easily removed and replaced but will not fall of accidentally.

ESP60089	Total 100gm	Each of 10gm
ESP60090	Total 250gm	Each of 25gm
ESP60091	Total 1000gm	Each of 100gm
ESP60092	Total 250gm	Each of 50gm
ESP60093	Total 100gm	Set of one hanger 20gm, three slotted masses 20g one mass 10gm and two masses 5gm , Total 100gm
ESP60094	Total 250gm.	“Set of one hanger 50gm, nine slotted masses 20gm, one mass of 10gm and two masses of 5gm Total 250gm.

Hooked Masses Cylindrical

HOOKED MASSES CYLINDRICAL, Chromium plated with cylindrical weight with long hook. Loose or in wooden box.

ESP60095	10Gm each weight
ESP60096	20Gm each weight
ESP60097	50Gm each weight
ESP60098	100Gm each weight
ESP60099	500Gm each weight
ESP60100	1000Gm each weight
ESP60101	200Gm each weight

Weights Hooked Flat

Weights, Brass, with hooks on both sides. Set of 9 Pcs ,Capacity 500 gm ,comprises of 1 x 200gm, 2 x 100gm, 1 x 50gm, 1 x 20gm, 2 x 10gm and 2 x 5gm

ESP60106

Density Ball Specimen Set

Balls, metal with hook, 25 mm diameter, set of 6, comprising Aluminium, Brass, Copper, Steel, Lead and Zinc. Packed in Plastic Box.

ESP60113

Metal Cubes Set Of 6

CUBES Set of 6 comprising Brass, Lead, Iron, Copper, Aluminium and Zinc. Supplied in Plastic Case.

ESP60110	Side Size 10 Mm
ESP60111	Side Size 20 Mm

Weight Masses Hexagonal With Lifting Ring

Hexagonal with lifting ring. Within international tolerance. Set of 6 (50gm, 100gm, 200gm, 500gm, 1kg 2kg)

ESP60103

Young's Modulus Apparatus

Consist of :
Stand Base and Rod, Steel plate
1 pc, Boss-head, Universal
1 pc, Bearing Pin
1 pc, Helical Spring
10 N/m 1 pc
Comprises a scale plate carrying a 0 to 30mm scale, and a moveable vernier readable to 0.1mm. Both have bars with clamping screws for the wires and hooks for the tension weight and loading masses.A ceiling clamp is provided for the upper ends of the wires, together with a pair of large wood screws for attaching it to a convenient overhead beam, door frame etc.
A tension weight, mass 1.3kg approx, for the comparison wire is also included. Supplied WITHOUT load masses or wires.

ESP60108

Rubber Ball Small

ESP60121

Rubber Ball Big

ESP60122

Wooden Ball Small

ESP60123

Wooden Ball big

ESP60124

NEW

Cartesian Devil Diver

for demonstrating liquid pressure. The figure is immersed in a container of liquid and sinks when the pressure in the container is increased. Hollow glass figurine measuring approx. 45mm tall

ESP60125

Specific Gravity Metal Cylinder Set With Hooks

For specific gravity determinations. Each cylinder is 5 cm long and 13 mm diameter with hook at top. Metals included are of Aluminium, Steel, Brass and Copper.
Available in set or individually.

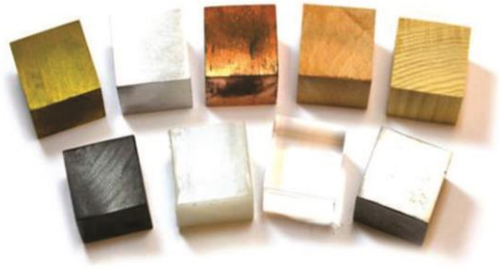
ESP60116

NEW

Specific Gravity Metal Cylinder Set Equal in Mass

Consisting of six cylinders with a diameter of approximately 16mm, each cylinder weighing 100g and varying in length from 5cm to 19cm. The set comprises one cylinder each made of copper, lead, brass, zinc, iron, and aluminium. These cylinders are drilled across their cross-sections for suspension purposes and are placed in cylindrical recesses drilled into a wooden block. Each cylinder is stamped with its identification. Additionally, these cylinders can be utilized in experiments concerning specific gravity or density to compare their relative densities.

ESP60117



Density Cube Set Specimen

Cubes for density investigation, 25 mm side. Set of 9 comprising brass, iron, copper, aluminium, hardwood, softwood, nylon, PVC and acrylic. Supplied in plastic box.

ESP60114

Pendulum Ball Drilled Ball Set, St/6

Set of 6 One each of Steel, Brass, Aluminium, Lead, Copper, Wood. These 1" (25mm) drilled physics balls are great for doing Newtonian physics experiments such as collisions or for use in mass/volume experiments. A 3m hole has been exactly drilled in the centre of each sphere in such a way as to allow for the recessing of a knot. This allows the set to also be used as pendulums. These crafted balls come in pairs which makes them ideal for comparing how different materials affect your experiment. Packed in Plastic Case.

ESP60119

Pendulum Ball Drilled Ball Set, St/12

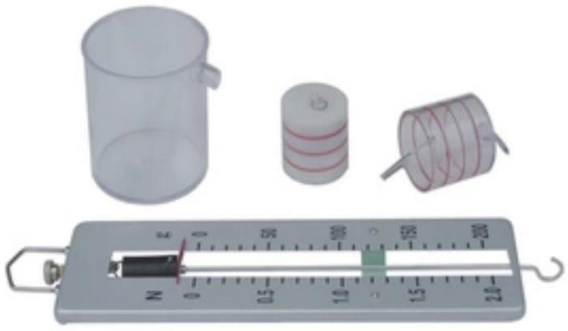
Set of 12 Two each of Steel, Brass, Aluminium, Lead, Copper, Wood. These 1" (25mm) drilled physics balls are great for doing Newtonian physics experiments such as collisions or for use in mass/volume experiments. A 3m hole has been exactly drilled in the centre of each sphere in such a way as to allow for the recessing of a knot. This allows the set to also be used as pendulums. These crafted balls come in pairs which makes them ideal for comparing how different materials affect your experiment. Packed in Plastic Case.

ESP60120

Displacement Vessel (Overflow Can)

Designed to determine the volume of a body to calculate density, specific gravity, or for proving Archimedes' Principle

ESP60131	Aluminium	75 mm dia. With flared top edge and angled spout.
ESP60132	Clear Acrylic	For determining the volume of the solid bodies and experiments on Archimedes principle. **Dimentions :** 60 X 160 mm, Material : TRANSPARENT plastic (SAN) Used with Measuring Cylinder 100 ml, Plastic for measures the spilled water volume in Archimedes experiment. **Part of :** Hydrostatics and Heat Kit for Junior High School - Hydrostatics and Heat Kit for Junior High School with Aluminium Case - Hydrostatics and Heat Kit for Junior High School (35 items) - Hydrostatics and Heat Kit for Junior High School - Archimedes Apparatus **Dimensions :** (L) 8.00 x (W) 6.00 x (H) 16.00 cm **Weight :** 0.060 kg



Archimedes Law Apparatus

Kit consist of Dynamometer , Overflow Vessel , and Cylindrical vessel with Archimedes Bucket and Cylinder , it enables teacher to demonstrate the value of Buoyancy force which act on the object is equal to the weight of the liquid displaced by this object

ESP60127

Vacuum Pump Hand Operated

Experiment with air pressure and atmosphere, vacuum filtering and check for leaks. This economical pump features a gauge in cm and inches, Hg displaces 725ml of air. Pump rate of 15ml. Clear tubing is 60cm with 6mm inner diameter.

ESP60143

NEW

Barometer Siphon without Mercury

simple barometer yet having sufficient accuracy. The whole column of mercury is clearly visible in the glass tube. Barometer scale is graduated in both English and Metric systems. Vertical sliding zero point adjustment is carried by a screw clamp attached to the glass tube. Complete apparatus mounted on a polished wooden board. Supplied without mercury

ESP60144

Magdeburg Hemisphere Rubber

To demonstrate pressure of atmosphere fitted with handle. Made of rubber .

ESP60150

Bourdon Gauge

Comprises a circular gauge on a pillar fitted on a heavy base, with a tubule to provide connection to the pressure system.

ESP60147

Capillary Apparatus

For demonstrating the relationship between capillary pressure and the bore diameter of the capillary tube. The apparatus comprises of a metal frame arrangement whose base is like a trough and the upper part of the frame supports six capillary tubes of different box. The trough is filled with water and the difference in heights of the resulting columns of water in the tubes is readily apparent. Overall height of frame 90 mm length of capillary tubes 150 mm

ESP60134

NEW

Charle's Law Apparatus

Comprising of a U-shaped glass 15 mm in dia. with one plain limb 220 mm long ; one graduated limb, overall length 120 mm Limb graduated 25 to 35 x 0.2 ml ;terminating in a bulb 37 mm diameter with third limb 185 x 6 mm length x ;bore, jointed at right angles to the plain of the other two. Short length of the rubber tubing with two pinch clips on short length of glass tubing mounted atend of wide-bore plain limb with rubber bung. With tall farm beaker 1000 ml capacity and stirrer. All glass parts made from Borosilicate glas

ESP60146

Venturi's Tube

To demonstrate Venturi effect. Made of glass with three side tubes for attaching an included three-leg manometer. The manometer is filled with coloured water to show the relative pressure at significant points of the tube when gas is flowing through it.

ESP60145

Magdeburg Hemisphere Brass

To demonstrate pressure of atmosphere fitted with stopcock and handle. Made of brass and diameter 75mm.

ESP60149

ESP60136

ESP60137

ESP60138

ESP60139

ESP60140

Boyle's Law Apparatus

Use this apparatus to experiment with the elastic properties of a measured quantity of gas. This unit makes the understanding of Boyle's Gas Law easy and helps to show the relationship between the pressure, temperature, and volume of a gas that is constant

ESP60136	Simple form	Consists an air tight plastic syringe supported between two wood blocks. Placing various weights on the upper block ; compresses the gas, allowing pressure and volume measurements to be made to verify Boyle's Law.
ESP60137	Boyle-Marriott	A 50ml plastic syringe is connected to a pressure gauge with a connecting tube to measure the pressure. Mounted on a plastic base.
ESP60138	With temp .Gauge	Simply twist the handles to compress the air and read the volume, temperature, and pressure from the scales. Repeat the process to confirm that the relationship stays the same. Requires one AA battery (not included). Grades 9-12.
ESP60139	Standard	For the investigation of the relation between capillary rise of liquid and the bore diameter of the capillarity tubes constructed in the form of communicating vessels in which the liquid is contained. Overall **Dimentions :** 135 x 60 x 110 mm ; Material : Borosilicate glass, Tube mounted on a metal plate holder **Dimensions :** (L) 17.50 x (W) 6.00 x (H) 13.00 cm, **Weight :** 0.105 kg
ESP60140	Demonstration type	For demonstration of Boyle's Law to group of students. With glass tube protected by a safety screen, Volume of air is read from a scale visible behind the tube and pressure is measured by a bourdon gauge. Mounted on a metal base. Supplied with oil.

ESP60140ACES BOYLE'S LAW Pump And Attachment Set — Spare pump and attachment for the Boyle's Law Apparatus

Boyle's Law Apparatus Advance

It is a device that can test the Boyle's law that the pressure of a gas at a certain temperature and its volume are inversely proportional to each other.
A piston with a graduated cylinder mounted on it and a low friction piston mounted on it. It is designed to increase the weight one by one on the plate and to measure the volume of the cylinder.
the valve used to set the cylinder volume and the auxiliary valve used to measure the cylinder pressure in the external device are installed.
Dimensions : 160x110x215mm
Configuration : Body (cylinder, piston, twin valve),
Weight 250g6, open valve 2, Cylinder capacity 20 ml, piston mass 41g

ESP60141

Barometer Demo Set

For a simple and fast explanation of air pressure and the movement of the pointer on a barometer. The barometer is placed in an air-tight, transparent plastic container. The air pressure changes by compressing and expanding the container, and the pointer indicates these changes. Barometer 980 - 1040 hPa and plastic container with lid and suction pad.

ESP60142

Absolute Zero Apparatus (Gay Lussac - Apparatus, Complete)

For determining the relationship between pressure and temperature in a gas at a constant volume as well as determining the point of absolute zero.
Hollow metal ball with attached high-quality manometer; the metal adapter piece enables it to be mounted on the lid via 4 holes .
Metal ball: D = 60 mm Manometer
range: 840 - 1240 hPa

ESP60148

Bell Jar Plastic With Vacuum Plate. Supplied With Buzzer And Foam

Made of high-impact plastic with rubber gasket for sealing the vacuum and measures about 35cm high and 20cm in diameter at the base. Hand operated vacuum pump manometer mounted on bell jar to show the degree of vacuum inside the jar. The apparatus also has vacuum release valve built into the handle of the pump.

ESP60152

Pascal's Law Apparatus Superior

For demonstrating the hydrostatic paradox, by means of a membrane deforming under pressure, downward hydrostatic pressure in the vessel is transferred to a 200 mm lever and displayed on a large scale, 4 glass vessels of various shapes, height: 220 mm each, internal Diameter at mouth = 23 mm, adjustable pointer for marking height to which filled,
Dimensions : 260x100x100(360) mm

ESP60158

Air Pressure Student Kit

Kit consisting of:
1x Signaler
1x Sound-absorbing pad 1x Magdeburg circle
1x Balloons, set of 2
1x Clamp for balloons 1x Bubble burster,
1x Plastic film for bubble burster
1x Capsule plastics with cover, D=75 mm
1x Free fall tube SE, L=35 cm,
1x Vacuum chamber complete, 1000 ml, with manometer 1x Syringe plastics, 120 ml, for vacuum-experiments
1x Vacuum hose plastics, 300 x 6 mm
1x Manometer ES, for Boyle-Mariotte experiment

Storage:
1x Box insert Air pressure
1x Storage box II small, with cover Box -insert plan with 2 labels

ESP60153

Spouting Cylinder

To show liquid pressure increases with depth. A sheet metal cylinder with three orifices of same size but at different heights.

ESP60155

Spouting Cylinder Perspex

This new spouting cylinder is made of Perspex which gives a clear view of variation of level of liquid and pressure. Spouting cylinder is 16" tall with a 1.75" diameter mouth mounted on a 4" x 4" base. There are no graduations on the spouting cylinder.

ESP60157

Pascal's Law Apparatus - New

Pascal's Apparatus has been designed to easily demonstrate that the pressure in a vessel is the same in every direction. The apparatus is mounted in a strong shock resistant plastic base.

ESP60159

Liquid Level Apparatus

Four glass tubes of different shapes and cross sectional areas are connected to a common horizontal tube.

ESP60160	Standard
ESP60161	On wooden stand
ESP60162	On plastic base

Manometer

ESP60164

ESP60165

ESP60164	Student type	For the use at moderate pressures, fabricated from gl ass tubing 6mm bore, 8mm outside diameter. The apparatus is open at both ends and is supplied unfilled.
ESP60165	Demonstration type	Glass manometer with built-in stopcock mounted on back plate. Scale 80-0-80 with 2mm subdivisions. Back plate dimension 40x8cm.

NEW

Lift Pump

Lift Pump, mounted on Stand , Glass working model with visible valves, fitted on wooden stand

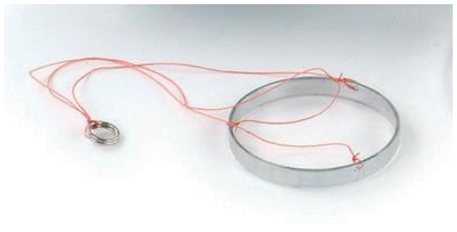
ESP60169

Hydraulic Press, Working Model With Round Tank

Acrylic model for demonstrating how hydraulic force is transferred, this model can be used not only to show the movement of the pressure and press pistons and the valve clearance, even practical examples of use in real life can be demonstrated. The ratio of the surface areas of the two pistons is 1:12, while the sturdy manner in which the press is built allows it to exert up to 500 N of press force!

Piston D=16 mm and 56 mm
Free working height: 60 mm
Dimensions : 200x70x285 mm **Accessories included:**
Metal bracket with notches, **Dimensions :** 40x40x20 mm Iron nails, L=80 mm, set of 20
Styrofoam ball, D=30 mm
Vat with drain connector
Acrylic, D=200 mm, H=65 mm

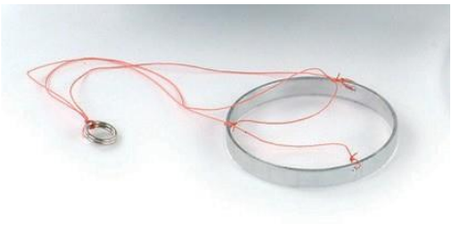
ESP60168



Surface Tension Apparatus

Ring for measuring surface tension

ESP60179



Surface Tension Apparatus Superior

Ring for measuring surface tension, Newton meter sensitive Digital 20 N / 2000 g

ESP60180

NEW

Bifilar Suspension Apparatus

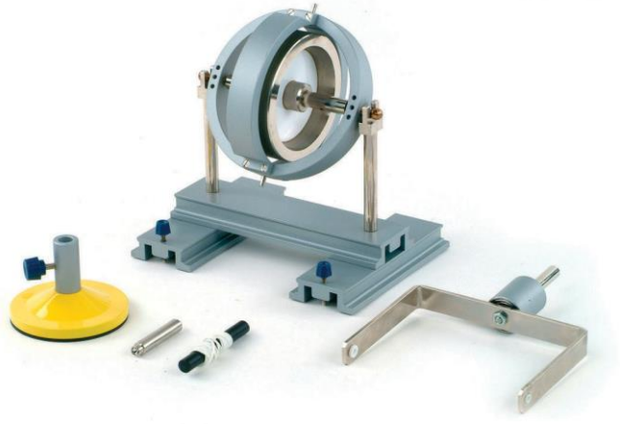
Height rugged steel frame 1200 m Stop Watch Digital Type ; Overall weight approx 25 kg Product Description Features:10mm size Drill chuck with Allen Keys to suspend the mass - 3 nos. to be used

ESP60225

Gyroscope Model Metal

For demonstrating the characteristics of a freely moving gyroscope as well as its processional motion;

ESP60184



Gyroscope Model

For demonstrating the characteristics of a freely moving gyroscope as well as its processional motion; massive, cylindrical gyroscope suspended from gimbals; long duration of rotation due to beryllium-bronze axis bearings; supplied with permanently mounted fork on small H-shaped base with levelling screws (for mounting when spun with cord); flexible metal fork on support rod with double ball bearings; round base; support rod with bearing cup and cone; cord for spinning with handle; **Gyroscope :** 100 x 30 mm,

Approx. Weight : 1400g;

Total Dimensions : 195 x 140 x 210 mm

ESP60183

Osmometer - Mem- brane 5 Pcs. (Spare)

Set of 5 semi-permeable membranes; can be clamped to the osmometer

Demo; Dimensions : D = 100 mm

ESP60188

Spheres Steel

Spheres steel (Pk of 100). High quality steel ball bearings.

ESP60170	Dia 3mm
ESP60171	Dia 6mm
ESP60172	Dia 10mm
ESP60173	Dia 13mm
ESP60174	Dia 16mm
ESP60175	Dia 19mm
ESP60176	Dia 25mm

NEW

Steel Ball

ESP60231	Steel Ball Bearing 3mm (Pack of 50)
ESP60232	Steel Ball Bearing 6mm (Pack of 50)
ESP60233	Steel Ball Bearing 10mm (Pack of 10)
ESP60234	Steel Ball Bearing 25mm (Pack of 5)

Hydraulic Press

To show transmissibility of pressure. Two graduated syringes 20ml and 5ml are joined at bottom through a 3-way stopcock, the upper ends having strong platforms. On metal stand.

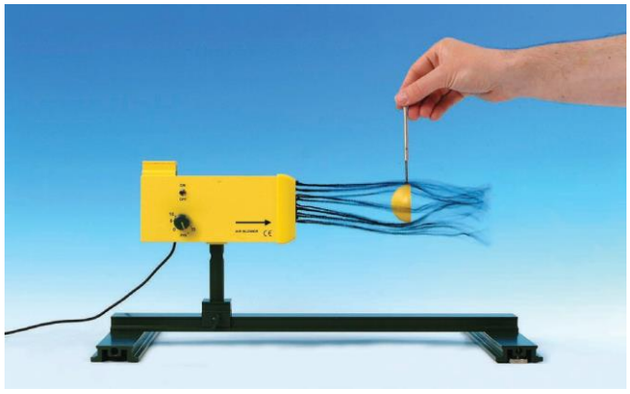
ESP60167

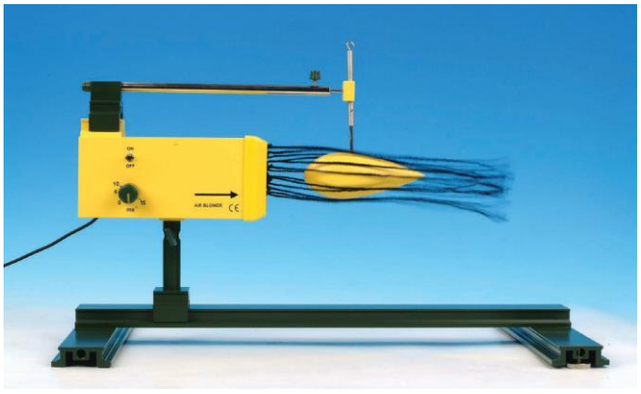
Osmometer

For measuring osmotic pressure; capillary tube with measuring scale mounted on an acrylic panel; two glass bulbs mounted on the capillary tube; one of the bulbs fitted with removable pig-bladder membrane and rubber ring.

Total height : 480 mm

ESP60187





Aerodynamics Kit

The following experiments can be run
Using the aerodynamics set:
Dynamic pressure in an air stream, Pressure in a flow - Venturi tube, Aerodynamic paradox, Aerodynamic paradox - examples, Lift in an air stream, Aerodynamic experiments on various objects, Air resistance and cross-sectional area, Air resistance, shape and cross-section of a model car, Air resistance and the shape of an object, Air resistance and type of surface, Flow patterns over a house roof, Blowing the roof off a house

Fixed Voltage Transformer

12V DC/10 A This transformer used for the air blower in the aerodynamic kit only.

ESP60194

ESP60193

Bases For Aerodynamics Kit

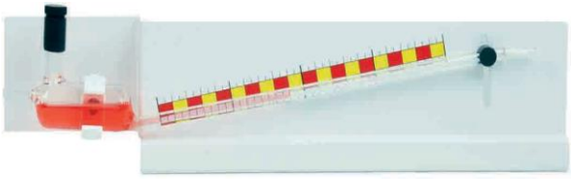
Sturdy metal stand base with large surface area; special aluminium profile anodised with clamp socket, for stable support of round or square rods and for holding sliders; laterally positioned claws made of fibre glass reinforced plastic, with rubber pads; clamp socket for holding round rods of 3-14 mm in diameter or square rods of up to s= 12.5 mm; with M8 wing screw; surface area: 265 x 220 mm (583 cm²); Weight : 383 g approx.

ESP60195

Hair Dryer Electric

ESP60200

NEW



Manometer Sensitive, Krell Type

For Aerodynamics Kit

For displaying very fine differences in pressure; inclined tube glass manometer; angle of inclination of vessel and riser pipe can be adjusted; metallic base plate; powder-coated; with scale; pressure-hose connection: D = 5 mm;

riser pipe: L = 250 mm;

Dimensions : 385 x 50 x 90 mm

ESP60196

NEW

Cantilever Apparatus

Material Stainless Steel - Weight set 100 gm to 1 kg -Horizontal arm 75 cm - Vertical arm 20 cm - Display Analog

ESP60222

Lever, Single Kit

The lever kit teaches students through hands-on design, construction, testing, and design iterations. Create the structure with the highest strength to weight
ratio to win this engineering competition! A great way to teach middle school students basic engineering and to learn iteration by studying failure, or teach high school students basic statics, free body diagrams, failure modes, and member sizing calculations while complying with STEM education standards. Includes materials and tools for constructing levers; instruction manual with sample calculations, basswood members, balsa members, adhesive, adjustable cutters, and base material. An ideal training kit for Science Olympiad and other building competitions. Required: electric drill and bit. Grades 6-12

ESP59613

Lever, Single Kit Refill

ESP59614

Lever Test Kit

The test kit includes everything required to test your levers for competition, except for the ballast (sand), including a test stand that can fit on any table with a lip, a loading block, a boomilever scale, a ballast scale, a scoring sheet, chain, S-hook, bucket, beaker with handle, and plastic trap. Grades 6-12

ESP59615

Boomilever Class Challenge Kit

The boomilever kit teaches engineering through hands-on design, construction, testing, and design iterations. Create the structure with the highest strength to weight ratio to win this engineering competition! A great way to teach middle school students basic engineering and to learn iteration by studying failure, or teach high school students basic statics, free body diagrams, failure modes, and member sizing calculations while complying with STEM education standards. Includes materials and tools for constructing boomilevers; instruction manual with sample calculations, basswood members, balsa members, adhesive, adjustable cutters, and base material. An ideal training kit for Science Olympiad and other building competitions. Required: electric drill and bit. Grades 6-12

ESP59617

Boomilever Class Challenge Kit Refill

ESP59618

Structure And Bridges Classroom Kit

Gain a comprehensive understanding of structural engineering and learn how engineering concepts are applied in supporting or resisting loads. The class will study different types of bridges and the STEM principles that support their designs. During the unit, students will construct six working models including a house, a suspension bridge, a cable-stayed bridge, an arch bridge and two different truss bridges. They will also be challenged to build the largest free standing tower possible using the Engino Components included in the kit. Finally, the students will apply their new knowledge to design and build a straw bridge that spans 70 cm and will support a minimum 2 kg distributed static load using only 100 plastic straws and a limited amount of masking tape. Includes all building and testing materials, instructor's manual, lesson plans, Engino hands-on activity books, building instructions, and student worksheets. Grades 7-12

ESP59620

Luxmeter

Display: 3 inches digits, big LCD, Max display 1999.Wide Range: from 0.1 Lux to 200,000 Lux, Accurate test, fast response, and auto zero-adjustment.
Data hold : hold the current test result. Symbol and unit display, easy to read.
Low battery indicator and auto power off.
Range : 0-200,000 Lux
Basic Accuracy : app 4%
Repeatability : app 2% Temp
characteristic : 0.1%/C Max.
Display : 1999
LCD Dimentions : 67x40mm
Battery : 9V (6F22) **Dimensions :** 130x95x30mm

ESP60238

Micrometer Digital

Measuring range : 0-25mm , Readability : 0.001mm

ESL57786

Vernier Calliper - Model Transparent

Overhead functioning model (OFM), consisting of an acrylic plate and a sliding vernier scale
Dimensions : 200x100 mm

ESP60246

Vernier Calliper Digital

Measuring range : 0-150mm , Readability : 0.01mm

ESL57781

Newtonmeter Demo Digital 20 N / 2000 g

Featuring force measurement over a minimum of distance, yet with a high degree of precision, and a 26 mm digital display, making this device especially “simple, easy and safe” to use. Demonstration instrument with magnetic holder for measuring force (in newtons) or mass (in grams). The easy-to-read LED display (H = 26 mm) and the external sensor in a rugged case of rectangular tubing make it an ideal instrument for mechanics experiments, particularly when used with a magnetic panel. Both tension and pressure can be measured. By means of a support rod (D = 10 mm) the sensor can be fastened to common stands.

TECHNICAL DATA :
Measuring range „N“: ± 20 N, resolution: 0,01 N
Measuring range „mN“: ± 2000 mN, resolution: 1 mN
Measuring range „kg“: ± 2 kg, resolution: 1 g
Measuring range „g“: ± 200 g, resolution: 0,1 g
Zero compensation (tare): manual, by means of adjustment knob
Accuracy: better than 0.5 %
Power supply: 4 x 1.5 V Mignon cells (included) or external power supply 6 V / 500 mA
Dimensions : approx. 160 x 120 mm

ESP60240

Hygrometer Demo Unit

For a simple and fast explanation of humidity and and pointer deflection in a hygrometer.
The hygrometer is placed in an air-tight, transparent plastic box, with a small container of hot water.
Once the box is closed the humidity increases, as is indicated by the pointer deflection.
Hygrometer (0 - 100%) plus large and small plastic boxes

ESP60267

Universal Multimeter Demo II

Durable servo-controlled measuring instrument to measure current and voltage with high precision; can be used in any position, for example vertically or horizontally for projection.

The large scale with an arc length of approx. 200 mm, the wide signal-coloured pointer and the 26 mm high digits guarantee a hassle-free reading of the measured values even from greater distances. The LED display indicates the unit of measurement and current type and is also clearly visible from the distance. An internal electronic overload protection eliminates the annoying

and time-consuming change of fuses. The meter can also be used as a sensitive galvanometer (measuring range 1 mV-) thanks to the built- in amplifier. Pointer setting: Zero at left or at midpoint Four insertable double scales: 1/3 - 10/30 - 100/300 - -5 to +5/-15 to +15 (included) Measuring ranges:

DC voltage: 1 mV, 1 to 30 V
AC voltage: 1 to 30 V
DC and AC amperage: 100 µA to 10 A
Rear panel with neodymium magnets for a stable magnetic mounting;
Battery compartment for easy replacement of batteries.

Technical data :

Type of instrument : Moving-coil instrument
Internal resistance : R = 100 kOhm / V Working
position : vertically or horizontally Measuring
inputs : 4 mm safety socket
Fuses: internal electronic overload protection
Power supply : four 1.5 V batteries (included)
or 2.5 mm hollow DC jack for 6 V external power supply
Housing : ABS plastics
Dimensions : 268 x 92 x 226 mm

ESP60249

Multimeter Analogue

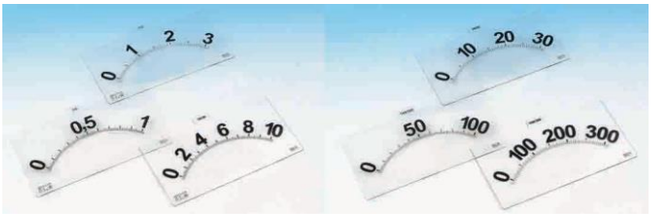
Electronic overload protection with indicator light in all measuring ranges (no more melting fuses!) Large, robust design with holster Easy- to-read thanks to being inclined Transparent base with recessed handle to hold the device with one hand

Portable measuring device for voltage and current, DC and AC; also usable as a galvanometer.

AC/DC voltage ranges: 1 mV, 100 mV - 30 V
AC/DC current ranges: 100 µA - 3 A and 10 A Arc
scale length approx. 90 mm
- 1 mV upper value range for measuring thermal voltage or induction without a pre-amplifier
- All measuring ranges (even low current) available in AC
- Exceptional frequency response (typically -1.5 db at 20 kHz) allowing direct measurement of resonant circuits
- Large, easy-to-read mirrored scale with clear marking
- Extremely accurate, typically 1.5 %
- Durable selection switch
- 10 A range with separate input socket
- Zero at midpoint may be selected by switch

Dimensions : approx. 200 x 140 x 100 mm
Weight : approx. 675 g

ESP60251



Scales For Multimeter Demo II, Transparent,

Set Of 8
Transparent inserting-scales; acrylic;
For universal multimeter demo II ESP60249
Ranges: 0-1, 0-3, 0-10, 0-30, 0-100, 0-300, -5 to +5, -15 to +15

ESP60250

Ohmmeter Demo Unit

Demonstration meter for measuring resistance and for testing diodes, the component to be measured is connected to the two 4-mm safety jacks, this instrument is easy to transport and can be mounted magnetically, the 26-mm LED display showing the measured value and the 20-mm LED display for the measurement unit allow readings to be taken easily even at a distance

Technical data : Display: 3 1/2-digit LED display, digit height 26 mm -Measuring ranges: 200 Ohms, 2, 20, 200, kOhms, 2 MOhms, 2 V (diode testing) -Accuracy: ±0.2 % ±1 digit for all ohmage ranges up to 200 kOhms, beyond that

ESP60253

NEW

Ohm Law Apparatus :

This apparatus is designed to demonstrate Ohms Law. Consisting of a sheet metal enclosure with milliammeter, voltmeter, rheostat, push key and terminal posts..

Simply connect an external battery and a suitable resistance to the terminal posts, then press the push key. Readings are taken from the milliammeter and voltmeter and the resistance is calculated using Ohms Law.

Current flow controlled through circuit by rheostat

Colour coded connection terminals

Scratch resistant enclosure

Circuit diagram printed on enclosure to aid understanding

ESP59456

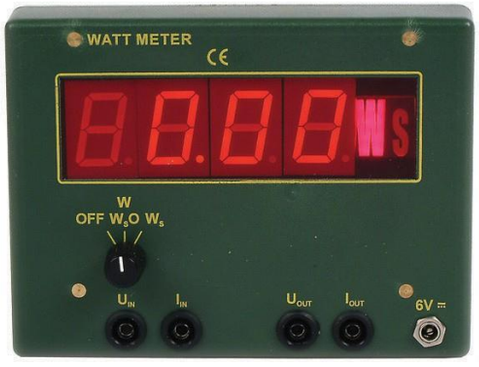
Coulomb Meter Demo Unit

Demonstration meter used in electrostatics for measuring charges, this instrument is easy to transport and can be mounted magnetically, the 26-mm LED display allows readings to be taken even from a distance Display: 3 1/2-digit LED display, digit height 26 mm -4-mm safety jacks: measurement input (IN) and common ground (COM) Measuring range: +/-1999 nC, reset button for resetting instrument to zero -Accuracy: better than 1 %, droop rate: better than 5 digits/min Throw switch: ON/OFF

Power supply: 4 x 1.5 V Mignon cells (included) or 5.5-mm hollow DC jack for 6 V/500 mA external power supply (Not included)

Case: green ABS plastic with yellow labelling

ESP60259



Wattmeter Demo Unit

Demonstration instrument for measuring power in low-voltage circuits, very easy to transport and magnetically mountable, the 26-mm LED display showing the measured value and the 20-mm LED display for the measurement unit allow precise readings to be taken even at a distance **TECHNICAL DATA :**

Display: 3 1/2-digit LED display, digit height 26

mm Input: 4-mm safety jacks (pair)

Types of measurement: true power (W), work/energy

(Ws) Measurement limits: 20 Veff, 2 Aeff

ESP60256

Electroscope Digital Demo Unit

Demonstration meter for measuring high electrostatic voltages, unlike mechanical electroscopes, this instrument delivers exact and clear quantitative readings as well as the polarity of the charge, the value measured can be frozen using the hold switch, this instrument is easy to transport and can be mounted magnetically, the 26-mm LED display allows readings to be taken from a distance

TECHNICAL DATA:

Display: 2 1/2-digit LED display, digit height 26 mm

Measurement input provided by means of specially insulated 4-mm safety jacks

4-mm safety jack for ground

connection Measuring range: 0 ...

18.0 kV

Reset button for resetting instrument to

zero Accuracy: better than 2 % for 0 ...

10 kV Throw switch: ON/OFF

Throw switch: measure sample - freeze measured value (hold)

Power supply: 4 x 1.5 V Mignon cells (included) or 5.5-mm hollow DC jack for 6 V/500 mA external power supply (not included)

Case: green ABS plastic with yellow labelling

ESP60262

Sound Kit Acoustics 1

Equipment set for carrying out 22 experiments on the topic Acoustics 1. You can see the exact contents of the equipment and the experiment topics in the attached "Appendices". If you only want to carry out individual experiments, you are welcome to select them in the Xperimente Configurator

ESP60269

Experiments

SOUND GENERATION
1.1 Sound generation with the ruler
1.2 Sound production with the drum
1.3 Vibrations at the tuning fork
1.4 Sound generation and amplification
ANALYSIS OF SOUND
2.1 Sound - harmonic Oscillation
2.3 Tones are vibrations
2.4 Tone, sound, noise, bang
2.5 Pitch and loudness
2.6a Sound level and volume
2.6b Sound level - recording
2.6c Sound level of several sound sources
2.7 Frequency determination
2.8 Audible range
SOUND PROPAGATION
3.1 Propagation of sound waves - Slinky
3.2 Sound propagation in air
3.3 Sound propagation in solids
3.4a Sound propagation in liquids - 1
3.5 Sound insulation - Sound attenuation
SOUND AND OUR BODY
4.1a Sound and body - directional hearing - 1
4.2 Sound and body - bone conduction
RESONANCE AND REFLECTION
6.1 Reflection of sound, echo
WAVE PHENOMENA
7.1 Interference on a tuning fork

Kit consisting of :

Ruler, plastics, 300 mm 1
Tuning fork 440 Hz with resonance box 1 Drumstick with rubber ball 1
Beaker plastics, transparent 1
Slinky spring, plastics 1
Pendulum bob, steel, D=1" 1
Loudspeaker for mobile, with base plate Set, consisting of:
Loudspeaker for mobile
Base plate for loudspeaker 1
Charger 5 V
Sound source for experiments on acoustics; compact loudspeaker for a mobile phone, tablet, or PC/Notebook (also iPhone, iPad, iPod) as well as for MP3 Control buttons for play/pause, volume, track forward/backward On/off switch Robust grille protection for the speaker membrane Aluminium housing, metallic colour Cable for connection to a mobile device and for charging the battery Device-shaped plastic base plate 120x90x25 mm 1
Sound level meter "mini For electronic measurement of the sound level; Sound level: 30 ... 130 dBA (±1.5 dB) Measurable frequency: 31.5 Hz ... 8 kHz Measured value acquisition: fast (125 ms) / slow (1 s) LCD display, display height: 17 mm Condenser microphone: D=12 mm with windscreen MAX/MIN/AVG measurement Data hold function Overrange and underrange display Backlight Automatic switch-off after 5 minutes Incl. 3 x 1.5 V batteries (AAA) 1
Drum, D=200 mm, with rod
Drumstick, wooden 1
Styrofoam beads in a plastic box
Funnel plastics, D=70 mm 2
Tubing plastics, 7/10 mm, L=100 cm, transp. 1
Pendulum ball, hard plastics, D=40 mm Storage: Box-insert "soft" Acoustics
Storage box - bottom, II, big Storage box - lid, II, with fleece Box insert plan with 2 labels

NEW

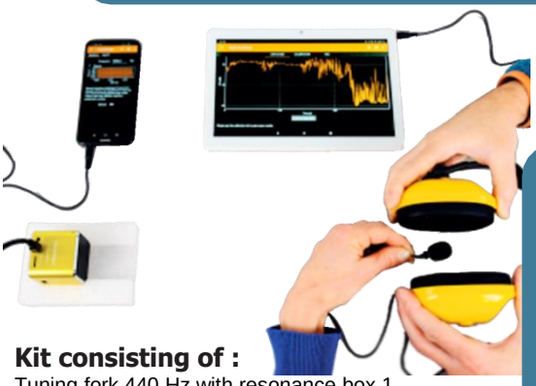
Sound Kit Acoustics 2, Supplement to Acoustics 1

Equipment set for carrying out 9 experiments on the topic Acoustics 2. You can see the exact contents of the equipment and the experiment topics in the attached "Appendices". If you only want to carry out individual experiments, you are welcome to select them in the Xperimente Configurator

ESP60270

Sound Kit Acoustics 2, Supplement to Acoustics 1

NEW

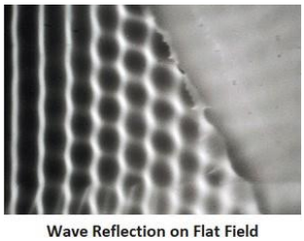


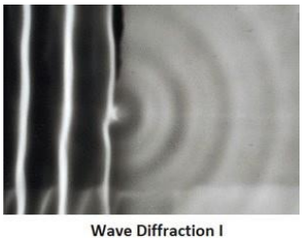
Experiments

SOUND PROPAGATION
3.4b Sound propagation in liquids - 2
3.6 Sound insulation - for our hearing
SOUND AND OUR BODY
4.1b Sound and Body - Directional Hearing - 2
STANDING WAVES
5.1 Standing waves
5.2 Standing waves - speed of sound
RESONANCE AND REFLECTION
6.2 Resonance at two tuning forks
WAVE PHENOMENA
7.2a Interference - Beat (2 tuning forks)
7.2b Interference - Beat (1 tuning fork, 1 loudspeaker)
7.3 Doppler effect - Acoustics

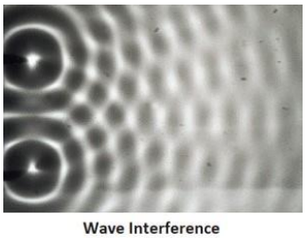
Kit consisting of :

Tuning fork 440 Hz with resonance box 1
Tuning fork rider 1
Labels adhesive, coloured, set of 100 pcs.
Case for mobile, waterproof 2 pcs
Microphone for mobile 1
Earmuffs For experiments on sound protection of the hearing;ear pads: PVC
Resonance tube "compact" For demonstrating "standing waves" and to determine the speed of sound, in combination with two holders and the piston
Holder for resonance tube 2 Pcs
Piston for resonance tube 1
Box-insert "soft" Acoustics
Storage box II big, with cover Box storage plan and 2 stickers


Wave Reflection on Flat Field


Wave Diffraction I


Wave Diffraction II


Wave Interference

Thermodynamics And Wave Kit 1

Experiment Topics :
GU 1 Wave Reflection on Flat Field, GU 2 Wave Reflection on Curves Field, GU 3 Wave Refraction, GU 4 Wave Diffraction I GU 5 Wave Diffraction II, GU 6 Wave Interference, GU 7 Wave on a String, Part I, GU 8 Wave on a String, Part II
PU 1 Heat Capacity, PU 2 Specific Heat, PU 3 Heat of Fusion Corrugated Box Thermodynamics Kit ESP60268 (English) 1 pc Experiment Manual Book 1

Additional tool (sold separately) :
- Audio Frequency Generator (ESP60296)
- Power Supply 3A, 36W (ESP60751)
- G Clamp 4 inch
- Balance 311 gr
- Steel Ruler 50 cm

Dimensions : (L) 66.00 x (W) 38.00 x (H) 32.00 cm
Weight : 13.400 kg

ESP60268

Ripple Tank Kit

Specifically designed by Irwin to demonstrate wave theory to secondary and tertiary education. The Irwin Ripple Tank is a shallow perspex tank of water used in school and colleges to demonstrate the basic properties of waves. It is illuminated from above; the light transmits through the water. The water's ripples show up as shadows on the screen underneath the tank, providing a visual depiction of all the basic properties of waves: Light, electromagnetic, sound, reflection, refraction, interference and diffraction are clearly observed and enhance the students understanding of the phenomenon.

The Irwin Ripple Tank comprises the following individual parts:

1 x Water Tank
3 x Detachable legs 2 x
Angular holders
1 x Plate fitting
2 x Fixing rods for Strobe-unit and vibration Generator 1 x
Perspex Mirror
1 x Frosted glass plate 1 x
Strobe-unit
1 x Vibration-Generator
1 x Frequency Controlling-Unit 1 x
Single dipper
1 x Double dipper 1 x
Triple dipper
1 x Dipper for parallel waves 1 x
Acrylic block, concave
1 x Acrylic block, rectangle Semi circle 1 x
Connection wire for Strobe unit
1 x Connection wire for Vibration-Generator
1 x TRANSPARENT Ruler for measuring
1 x Set of instructions
1 x Aluminium carry case

ESP60271

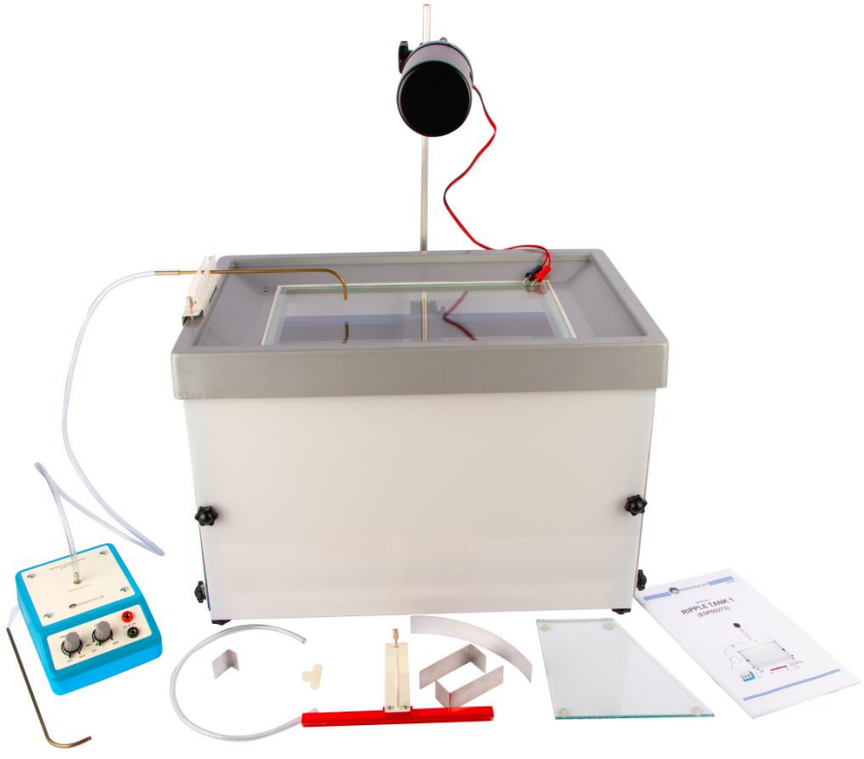
Ripple Tank 1

Dimensions :
- Height : 35 cm
- Base : 30 x 20 cm

Material :
Tank : Plastic
Base : Glass, TRANSPARENT

Consist of :
- Digital Ripple Generator 1 pc
- Tank 1 pc
- LED lamp 1 pc
- Mechanical Vibrator 1 pc
- Plane Wave Generator 1 pc
- Circular Wave Generator ripple tank1 pc
- Circular Wave Generator ripple tank 1 pc
- Long Barrier 2 pcs
- Short Barrier 1 pc
- Curved Barrier 1 pc
- Glass/plastic Trapezoid for refraction experiment 1 pc
- Manual Book of Wave Tank 1 exp

ESP60273



Ripple Tank 2

For use in demonstration or experiment on basic properties of waves in general such as reflection, refraction, diffraction and interference, by simulation with water surface waves. The water surface waves are generated in a ripple tank. The system has a reflector and translucent screen on which the waves shadow can be observed. The ripples are produced by Ripple Generator (ESP60277 11) producing periodic variation of air pressure the Plane Wave Generator (ESP60277 13) or Circular Wave Generator ESP60277 17).

Dimensions :
Overall : 500 x 320 x 355 mm Wave field : 450 x 270 mm Projection screen : 480 x 285
Supported by a demountable four-leg frame, height 300 mm Material : Plastic, glass, aluminium and steel

Consist of :
Wave Tray 1pc
Foot for Ripple Tank 1set, Side Bar 2pcs, Mirror Rod Holder 1pc, Support Rod 2pcs, Side Cover 2pcs, Refraction Plate 1pc, Ripple Generator 1pc, T Joint 1 pc, Plane Wave Generator 1pc, Short Barrier 1pc, Long Barrier 2pcs, Curved Barrier 1pc, Circular Wave Generator 1pc, Ripple Pipe Holder 1pc, Lamp Rod 1pc, Lamp Housing 1set, Lamp Bulb SBC 12V, 24W 1pc, Reflection Mirror 1pc, Translucent Screen 1pc, Multi-angle Clamp 1pc, Multifunction Bolt M6 x 15 mm 6pcs, Multifunction Bolt M8 x 35 mm 2pcs, Plastic Hose 40 cm 2pcs, Plastic Hose 100 cm 1pc, Disposal Hose 40 cm 1pc, Rubber Stopper without Hole, 6/9 mm 1pc, Manual Book 1exp, Additional tool (sold separately) : Power Supply 3A, (ESP60751), Part of Thermodynamics and Wave Kit for Senior High School (ESP60268).

Dimensions : (L) 85.00 x (W) 39.00 x (H) 20.00 cm
Weight : 8.800 kg

ESP60277

Ripple Tank with Digital Stroboscope ESP60279

- Ripple tank can be used to demonstrate wave motion concepts and principles such as traveling waves, reflections, refractions, and interference, laws of reflection and refraction, wave diffraction and the Doppler's effect.
- By observing the phenomena directly using a ripple tank, student can learn and understanding the phenomena easier.
- FGE 13 Ripple Tank is equipped with a stroboscopic illuminator unit, so the traveling waves generated in the wave tray could be made to appear at rest, thus facilitating observation and wavelength measurement.

Features

- Equipped with digital stroboscope technology for easier wave observation.
- Capable of displaying the benefits of the wave of impressions on Translucent screen mounted upright that can be observed directly by the students with easy.
- Stroboscope uses halogen lamps making clear images on the display. Can generate progressive and standing wave.
- Generated waves can be identified directly from the stroboscope's frequency. Stroboscope's halogen lamps produces clear images on the display.

Digital Stroboscope

Stroboscope Unit (PWM 145) has some features:

- Digital indicator (a) displays wave frequency.
- Light and wave synchronization mode (b).

In synchronous mode, the frequency of strob light and the water ripple are synchronized so that it seems still; in un-synchronized mode, the wave moves.

- Wave frequency (c) and wave amplitude adjuster (d).
- Stroboscope disc.
- Manual trigger function (f) to produce wave one by one.
- Halogen light source 12 V 5 A.
- Input voltage 12 V 5 A.

Component List

Cat. code	Component	Qty
FGE 12 01	Wave Tray	1 pc
ESP 12 02	Footing for Ripple Tank	4 pcs
FGE 12 03	Side Bar	2 pcs
FGE 12 04	Mirror Rod Holder	1 pc
FGE 12 05	Support Rod	2 pcs
GLA 203 02	Reflector Mirror	1 pc
GLA 204	Translucent Screen	1 pc
FGE 12 08	Side Cover	2 pcs
FGE 12 09	Supporting Bolts	4 pcs
FGE 12 10	Refraction Plate	1 pc
FGE 12 12	T Joint	1 pc
FGE 12 13	Plane Wave Generator	1 pc

Cat. code	Component	Qty
FGE 12 14	Short Barrier	1 pc
FGE 12 15	Long Barrier	2 pcs
FGE 12 16	Curve Barrier	1 pc
FGE 12 17	Circular Wave Generator	2 pc
KPP 41/004-100	Plastic Hose 100 cm	1 pc
KPP 41/004-040	Plastic Hose 40 cm	2 pcs
KPP 41/006-040	Disposal Hose 40 cm	1 pc
	Ring Plate	10 pcs
	Butterfly Nut	6 pcs
	Support Rubber	4 pcs
KSM 12/06-09	Rubber Stopper Without Hole, Ø 6/9 mm	1 pc
FGE 12 14	Short Barrier	1 pc

Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. code	Tool	Qty
ESP60751	Power Supply	1 pc

Experiment Topics

Experiment 01	Introducing Wave Motion on a Water Surface
Experiment 02	Generating Continuous Circular Waves
Experiment 03	Generating Straight Waves
Experiment 04	Reflection of straight waves
Experiment 05	Reflection of Straight Waves on Curved Wave Barrier
Experiment 06	Generating Two Coherent Point Wave Sources and Observing an Example of Interference
Experiment 07	Depth of Media Changes Propagation Speed
Experiment 08	Wave Diffraction by a Single Slit

Mechanical Shear for Doppler effect experiment

Ripple Tank FGE 13 performing Doppler effect experiments.

Ripple Tank - Simple

This economy Ripple Tank System comes as a ready-to-use unit with no external power source required. Comprised of a tough, moulded frame with a large transparent viewing surface. The Ripple Tank light source is a 6V halogen lamp which gives excellent illumination. The tank has sloping sides which minimise noise. This Ripple Tank System comes complete with :

A. Ripple tank
B. 4 Push-fit legs
C. Ripple motor, eccentric cam mounted on ripple bar
D. 3 Support pillars for supporting the light source and ripplier bar
E. 2 Motor support springs
F. Lamp unit with adjustable arm
G. 2 Ripplier bar hanging hooks
H. Power source for ripple tank
I. Hand stroboscope
J. Concave perspex plate
K. Rectangular perspex plate
L. Curved reflector
M. 2 Barriers
N. Roller Bar
O. Neatly compartmentalized box

ESP60280

Ripple Tank Controller

The unit provides two fully independent, continuously variable DC outputs 0 to 5V for the ripple tank motor, together with a fixed AC output to operate 6V, 20W bulb. Supplied with a detachable 1.5m main lead.

ESP60282

Ripple Tank Standard

Metal uprights are provided to carry a horizontal ripplier support and which can be adjusted in height with the help of screws, easily and precisely. The ripplier Assembly elastically suspended from the horizontal support rod, consists of a low voltage DC motor mounted on a wooden

/ plastic beam. The motor is fitted with an Eccentric mass, which causes beam to oscillate. Additional point contact sources are provided by two plastic spheres each mounted on a right angled metal shafts which when fitted to the beam, may be adjusted to required separation.

An adjustable rod fixes centrally into a socket in one side of the Frame and affords support for the illuminant.

A. Ripple Tank
B. Ripple Generator
C. Plane Wave Actuator Bar
D. Light Source and Cord
E. Ripple Tank Optics: Large and 2 small rectangular barriers of Glass
F. 1 each of Concave Lens, Convex Lens, Triangular Prism and Curve Stainless Steel
G. 1 Hand Stroboscope, black disc with plastic handle.
H. Power supply for Ripple Motor and Light Source
I. 1 sets of Metallic Rods and side screws for suspension of wave generator
J. Roll for production of straight vibrators
K. 20pcs of Rubber Bands
L. 1 Foam piece.

ESP60284

Ripple Tank Small Led

- This instrument provides a method to prove the basic phenomenon of wave, reflection, diffraction and refraction. LED strobes are installed at the lower part, and a 13x13cm rectangular water tank installed in the middle causes a water wave. It can be projected on the installed screen to clearly see the surface wave.
- To overcome the small size limit, increase the SYNC frequency by four times and you will not notice a difference between the normal ripple tank and the visual effect.

The LED strobe uses a high-power 3W class to provide a sharp image of the surface wave projection.

- The power supply is provided with a power supply with an input of 220V AC and an output of 12VDC. It is provided with single-wave, double- wave, and vibrator causing interference and reflection.

Dimensions : 150x200x160mm

Configuration: Body (SYNC Strobe, Wave source generator, Built-in screen) Power supply, single-wave double-wave source - Linear wave vibrator, Interference refraction object 4 pieces, Reflective object 1 piece 1 water tank 130x130mm

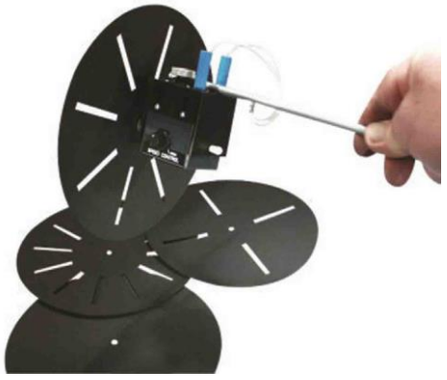
ESP60285

Digital Stroboscope Integrated Type

- It is used for proportional observation of fast movements such as falling motion and constant velocity motion, and for measuring the speed of a still picture or rotating body.
- It is classified as a combined type of light source and main body and a separated type. B type light source Integrated specification: External synchronization 4 ~ 10Vpp, output 20W, 60 ~ 15,120rpm AC220V **Dimentions :** 330*330*210mm

Weight : 4Kg.

ESP60288



Stroboscope - Motorised

Motorised Stroboscope is a useful device for the teaching of the stroboscopic. The hand driven discs and are difficult to keep at a constant speed. The motor driven stroboscope has an inbuilt speed control and maintains constant speed reasonably well. Supplied with a set of 3x discs with 4, 8 and 12 slots. A blank disc permits the creation of a disc in the classroom. The unit can be supported on a retort stand with a boss head. Runs from either AC or DC up to 12V. Maximum.

ESP60286

Stroboscope Digital , Xenon, Hand Held

- Operating Temperature : 0 to 50 deg C
- Accuracy : 100 to 5,000 (FPM/RPM) -+/- 1 digit
- Display 0.3\" LED, 4 digits.
- Stroboscopic Falsh rate : 100 to 10,000 flashes per minute (FPM).
- Resolution : Less than 10,000 FPM/RPM
- Sampling Time 1 second.
- Range Select Automation.
- Circuit : This stroboscope/tachometer employs an custom one-chip of microcomputer LSI circuit &
- crystal control time base which results in extraordinary accuracy over a wide, dynamic range.
- Power Supply 110 Vac 10%, 50/60 Hz. or 220 Vac 10%, 50/60 Hz. or 230 Vac 10%, 50/60 Hz.
- Power Consumption : Less than 30 Watt.
- Operating Humidity : Less than 80% R.H.
- Housing : Compact and impact plastic injection case with plastic mirror type reflector.
- Calibration : Crystal time base and microprocessor circuit, don\'t necessary take any external calibration process.
- Accessories included : Operation manual.

ESP60287

Signal Generator Irwin Power Signal Generator

The popular Irwin EA0030 Power Signal Generator comes with an output frequency from 0.1Hz to 100 KHz available through 6 switched ranges. Switchable outputs of Sine, Square, Triangle and Pulse. The output frequency ranges from 0.1Hz to 100kHz and is adjusted using both the six-position Range Hz switch and the multi-turn rotary Frequency control. The actual output frequency is continuously monitored and shown on the blue LED Display.
The output amplitude of the waveform ranges from zero to a maximum of 10V
peak to peak using the rotary Gain control.
It can also be used as a stand-alone Amplifier with a Voltage Gain (Av) ranging from zero to 100 (40dB) via the rotary Gain control and a frequency response of 1Hz to 100kHz (-3dB bandwidth). Note: the Amplifier has an input impedance of 1MW and a maximum input voltage of 200mV peak to peak (irrespective of the Gain setting).

Specification

Input Voltage 230V
50Hz Output 4W into 8 ohms
Manufactured in the UK

ESP60295

Signal Generator Irwin Sound-base A1

The Irwin microprocessor controlled Signal Generator offers frequencies from 1Hz to 35Khz. Sine, triangle, square and sawtooth waveforms are available. Complete with built-in loudspeaker. Supplied complete with a plug top power supply.
A Signal Generator with output frequency from 1Hz to
35KHz. Digital circuitry for accurate waveform shape.
Built in loudspeaker with amplitude control and on/off switch,
Selectable outputs of Sine, Square, Triangle and Sawtooth.
Waveform shape and frequency are selected by push buttons,
Function output for oscilloscope display.
Supplied complete with plug top power
supply. Manufactured in the UK

ESP60294

Vibration Generator

Generates the mechanical vibrations with alternating voltage input max. 3V AC, 10KHz from Audio Frequency Generator (ESP60296).

Dimensions :

110x110x65mm.
Displacement:6mm
Power: 3 watt
Impedance: 8 ohm
Input terminal: 4mm socket screw

ESP60299

Vibration And Audio Frequency Generator

An apparatus that generates various wave signal in audio frequency definition. I t can produce 5 kinds of wave shapes: square, sinusoidal, triangle, saw and pulse. Output impedance is 8 Ω with enough power to drive a loud speaker; 600 Ω output for audio amplifier input.

- Frequency range 0.1 Hz – 110 kHz.
- Sinus wave distortion less than 2% (1 kHz).
- Maximum power 3 W, 8 Ω.
- Input source 110/220 V with fuse.

ESP60296

Function Generator DDS

Features:

Max. Output frequency 5MHz 2
output channels
Direct Digital Synthesis technology (DDS)
Sampling rate 100MSa/s, vertical resolution 8 bits, waveform length 1024 points
Min. 1mV (50) Waveform output with good stability
32 built-in waveforms
40 sets panel setting save recall
Modulations: FM, FSK, ASK, PSK
Frequency sweep, amplitude sweep, burst and TTL output functions
Over voltage protection, over current protection, short circuit protection, reverse voltage protection
Standard parts: 200MHz frequency counter
Optional parts: RS-232 interface, power
amplifier **Specifications:**

Frequency range:1μHz~5MHz, Waveform (CHA), Type:32 built-in waveforms, including Sine, Square, Triangle, Ramp, Pulse, etc. Length :1024 points, Vertical resolution : 8 bits,Sampling rate:100MSa/s, Harmonic distortion of sine: 40dBc (1MHz); 35dBc (1MHz~20MHz) Total distortion of sine: 1% (20Hz~200kHz) Rise/fall time of square: 35ns Overshoot of square: 10% Duty cycle of square: 1%~99% Frequency (CHA) Range Sine: 1Hz~5MHz Range Square: 1Hz~5MHz Range Other: 1Hz~1MHz Resolution: 1Hz Accuracy : 5x10-5 Stability : 5x10-6/3hours Amplitude (CHA) Range: 2mVpp~20Vpp, 1Hz~10MHz (high impedance) 2mVpp~15Vpp, 10MHz~15MHz (high impedance) 2mVpp~8Vpp, 15MHz~20MHz (high impedance) Resolution: 20mVpp (2Vpp); 2mVpp (2Vpp), Accuracy : (1% 2mVrms)(high impedance, RMS, frequency 1kHz), Stability: 0.5% /3hours, Flatness: 5% (frequency10MHz);
~10% (frequency 10MHz), Output impedance: 50, DC Offset (CHA), Range: 10V (high impedance, attenuation 0 dB), Resolution:20mVdc, Accuracy: (1% 20mVdc), TTL output, Waveform :Square, rise/fall time 20ns, Frequency:10mHz~1MHz, Amplitude: TTL, CMOS compatible, low<0.3V, high>4V, Frequency counter, Testing frequency range :1Hz~200MHz, Input signal amplitude:100mVpp~20Vpp,

Common characteristics

Operation characteristics : Key operation for all functions, Menu display, Rotary dial adjustment
Display : Mono LCD
Language : English, Chinese (simplified), Chinese (traditional)
Power source:AC110V/220V 10% selectable, 50/60Hz, Max.
45VA Environmental condition:0~40?,<80%RH
Standard accessories : Power cord x1, Operation manual x1, BNC-BNC cable x1, Test lead x1
Dimensions : 385x260x110mm
Weight : 3.5kg

ESP60290

Function Generator Arbitrary Wave Form

Features:

Frequency range 1Hz~25MHz
2 independent output channels at same frequency range for main waveforms
4.5-inch TFT LCD display
Min. Output amplitude 1mVpp (50?), Total distortion 0.2%
Sampling rate 150MSa/s, vertical resolution 14 bits, waveform length 16k points
6 standard waveforms, 50 built-in wave forms and 12 user-defined arbitrary waveforms
10 sets save recall for operating parameters
Modulations: AM, DSSC AM, FM, PM, ASK, FSK,
BPSK
Synchronous output, external modulation input, trigger input, external reference input and count input
Linearity/Logarithmic sweep signal and Burst signal
Channel coupling, parameter (frequency, amplitude, offset, phase) coupling, point frequency replication tracking
Strong arbitrary waveform building software, support SCPI commands Over voltage, over current, short circuit and reverse voltage protections Standard interface: RS232, USB device, USB Host
250MHz external frequency
counter Optional power amplifier

Specifications:

Output frequency range:
Sine:1 μHz ~ 25MHz
Square: 1 μHz ~ 5MHz
Ramp: 1 μHz ~ 500kHz
Pulse: 1μHz ~ 5MHz
Noise: 30MHz white noise (-
3dBm) Arbitrary: 1μHz ~ 6.5MHz
Resolution: 1 μHz
Accuracy: app 5 to10-5
Output waveform :Sine, Square, Ramp, Pulse, Noise, Arb,
DC Waveform length : 8~16384 points (CHA), 8~2048 point (CHB) Vertical resolution:14 bits
Sampling rate:150MSa/s
Interface: USB Device, USB Host, RS232
Power source: AC100~240V, 47~63Hz, Max. 30VA
Accessories; Power cord x1, Operation manual x1, Software CD x1, USB cable x1, RS-232 cable x1, BNC-BNC cable x1, Test lead x1

Dimensions :

Chassis : 260Wx110Hx385D mm
Instrument : 295Wx195Hx415D mm
Weight : 4kg

ESP60291

Vibration Generator Accessories

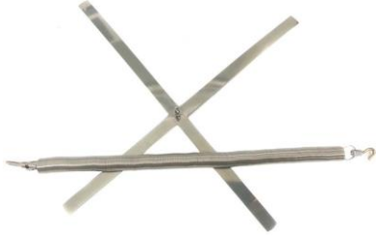
A vibration generator for exciting oscillating and waves mechanically,
e.g. in coil springs, a rubber cord, a wire ring or a Chladni plate. In robust plastic housing including mounting pin with 4mm socket for attaching accessories (Chladni plates, resonance wire, rubber band etc.). Including holder for stand rod (up to 8 mm diam.) on the rear side of the apparatus for the demonstration of standing waves in a coil spring. The generator is equipped with overload protection and is driven by a loudspeaker for smooth oscillations and fine travel stepping.
Spring and Resonance strips can be found here

Specifications:

Connection: via 4-mm safety
sockets Impedance: 8 ohm
Maximum amplitude: 5 mm
Frequency range: 0 up to 20 kHz
Minimum operating current: 10
mA Overload protection: 1 A
fuse Required : Function
Generator FG

Dimensions : approx. 200x160x70 mm?
Weight : approx. 1.4 kg

ESP60301



Vibration Generator Spring Kit

Steel strips giving six vibrating lengths. For use with our vibration generator. Fundamental frequencies at 11, 15, 21, 36 and 50 Hz can be readily observed. Interesting standing waves can be seen up to 300 Hz and heard up to 900 Hz. Also supplied is a quality steel spring ideal for producing longitudinal waves with a vibration generator connected to a signal generator. Spring constant 4.7 N/m. **Dimensions :** (L x Dia.): 155mm x 27mm.

ESP60302

Waves

Slinky Spring 80 mm

Slinky Dia 80mm Used for teaching the concept of wave motion and its properties Diameter : 80mm ;Length : Approx 120mm Material : Steel with the helix ;Dimensions : 8.70cm (L) x 8.70 (W) x 13.50cm (H) ; Weight : 0.500 Kg

ESP60308

NEW

Slinky Spring Helix

Steel wire close-wounded helix 20 mm diameter, closed length 3 meters extending to approx. 9 meters extended, with looped ends.

ESP60304

Slinky Spring With Stand

wave form helix is used to study wave behavior. The helix is a metal slinky spring that stretches for demonstrating wave forms, and can be used on stairs with a tall step height for further experimentation. The helix measures 20.0cm (H) when compressed, and has a wooden stand for display and storage. (H is height, the vertical distance from the lowest to highest point.) The helix is suitable for high school or college students, or ages 14 to 21. Helix will extend up to 65ft before distorting

NEW

ESP60306

NEW

Slinky Spring 70 mm

Slinky Dia 70mm
Used for teaching the concept of wave motion and its properties
Diameter: 80mm
Length: Approx 200mm
Material: Steel with the helic

ESP60304

Loudspeaker Unit

The Irwin compact loudspeaker unit is fitted with a 10 watt, 8 Ω Driver. Connection is via colour coded 4mm sockets. Fitted into a durable ABS case.

ESP60305

Meldes Apparatus

Apparatus for Meld's Experiment
Used to demonstrate the phenomena of wave standing on the rope and learn quantities that affects the speed of a wave on a rope

Consists of:

- Vibration generator 1pc - Table clamp with plastic pulley 1pc - Slotted Masses and Hanger - Ruler 50cm, stainless steel 1 pc - G Clamp 2 inch - Stand Base 1 pc - Stand Foot 1 pc - Stand Rod 500mm 2 pc - Stand Rod 250mm 1 pc - Universal Boss-head 1 pc
- Bearing Pin 1 pc - Nylon Thread 1 roll - Connecting lead 50cm, Red 1pc ; Connecting Lead 50cm, Black 1pc - Rod coupling 1pc

Additional tool (not included, sold separately): Audio frequency Generator

ESP60310

UPDATE ?

Slinky Spring 75mm

A helical construction made
longitudinal and transversal w
diameter 75 mm; shrunk state

Viscosity Tube

This apparatus is used to determine the fluid viscosity.

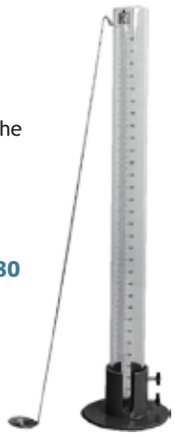
Flexiglass tube diameter 56 × 680 mm.

Graduation: 0 – 64 cm.

Tube seat, diameter 140 mm.

PMP 180

NEW



Meldes Apparatus Demo Magnetic

Magnetic panel assembly – equipment set for generating transverse standing waves,

Allowing nodes and anti-nodes as well as changes in their number at different excitation frequencies to be easily recognised.

Consisting of:

1x Motor with toggle for oscillation test , 1x Magnetic base, D = 43 mm, with tube and pin, 1x Magnetic base, D = 66 mm, with tube and pin, 1x Elastic string, white, L = 300 cm, 1x Rubber string, red, L = 300 cm

ESP60311

Ultrasonic Student Kit

Kit consisting of: 1x Ultrasonic control unit, 2x Ultrasonic transmitter, 1x Ultrasonic receiver, 1x Ultrasonic goniometer, 3x Slider with clamping post 40 mm, 1x Ultrasonic apertures, set of, with angle bracket, 1x Ultrasonic frame aperture for absorption experiments, 1x Ultrasonic parabolic mirror

Storage: 1x Box insert Ultrasonic, 1x Storage box II big, with cover, Box

-insert plan with 2 labels

ESP60315

NEW

Balance 311 g

Dish balance, 4 arms with shift-able load on each arm; the arms are supported by hard steel blade resting on agate stone support; equipped with magnetic stopper on the longer arm and zero adjuster bolt on the dish hanger; facilitated with adjustable base to measure object inside water.

- Capacity: 311 grams
- Accuracy: 10 mg

ESP 23

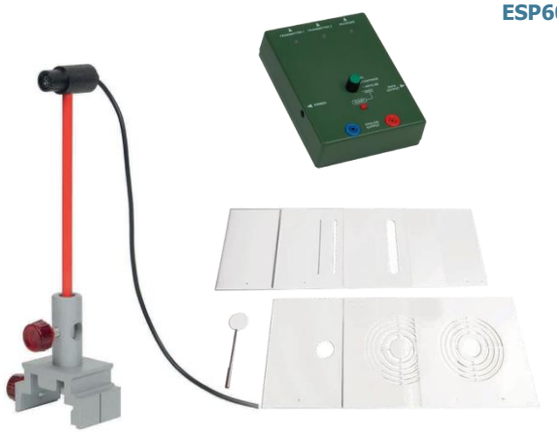
NEW

Meldes Apparatus Econ Kit

Kit consists of:

* Vibration Generator and Frequency Generator
* Retort Stand With Rod and Clamp & Boss Head
* Weight Pan With Weight Set and Pulley With Bench Clamp
* Cotton Thread, etc.

ESP60309



Ultrasonic Student Budget Kit

KIT Consist of the following :

Ultrasonic control unit, Ultrasonic transmitter, Ultrasonic receiver, Ultrasonic apertures, set of, with angle bracket, Kit of material

ESP60316

Oscillation Module 1 With Brake

21 double pendulums, 21.5 cm long each, mounted on a special aluminium profile.
The aluminium pendulum weights are cylindrical and mounted 1.8 cm apart so as to be able to rotate horizontally.
Adjacent pendulums are joined using two coil springs, allowing waves to be propagated.
Built-in brake pads allow the wave motion to be stopped immediately, so that, for example, wavelength may be measured.
Supplied with two padded aluminium feet and a clamp for creating a fixed end.
Total length : approx. 41.5 cm

ESP60317

Oscillation Module 2A With Brake

Used to extend module I, resulting in a unit with 42 double pendulums, which allows experiments to be observed more easily;
technical data similar to model no ESP60316;
Supplied with a rail connector and two coupling springs;
Total length : approx. 41.5 cm

ESP60319

Oscillation Module 2B With Brake

Used to extend modules I. Technical data similar to modules 1 and 2a, except that the pendulums are lighter (made of plastic), making it possible to achieve other wave velocities.
Supplied with a rail connector and two coupling springs;
Total length: approx. 41.5 cm

ESP60321

Drive Unit For Wave Demonstrator

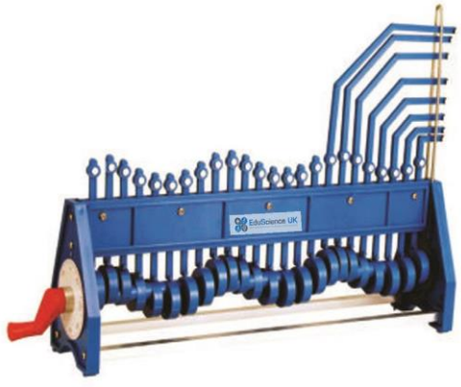
While waves or pulses can be generated manually, an electric motor produces constant motion,
Generating waves that are easier to observe and compare.
A DC motor, attached to a cam, controls the speed of the exciter plate, which in turn causes the pendulum motion.
Increasing or decreasing the amount of DC input voltage likewise affects the pendulum frequency of the exciter plate.
Aluminium case, 14 cm long, mounted on special aluminium profile with two 4-mm safety jacks,
Supplied with two coupling springs
Required accessories:
Power supply able to set variably from 0 to 6 V DC, 0.5 A min.

ESP60318

Damping Unit

This unit is mounted at the end of the wave demonstrator and serves by means of a damping plate submerged in water to prevent undesired reflection of waves.
The unit consists of one pendulum mounted rotatably, a water tub and two coupling springs.

ESP60320



Wave Apparatus Plastic

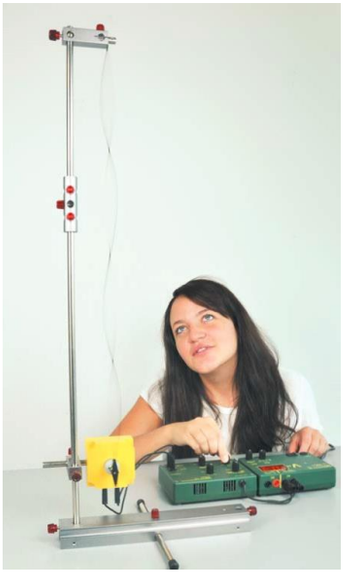
Made of plastic. The rotating handle is fitted with a circular scale marked in degrees to indicate the indication. The plastic highlighted tips make easy observation of wave motion.

ESP60314

Vibrations And Waves Student Kit

Kit consisting of:
1x Rubber string, 3 m
1x Flat spring steel, 0.6mm, L=300 mm 1x
Holder for pencil
1x Threaded rod with butterfly nut
2x Pendulum ball with hook, wooden, 1x
Pendulum ball with hook, plastics,
1x Motor with toggle for oscillation tests,
Storage:
1x Box insert Vibrations and waves, SE 1x
Storage box II mini with cover,
Box -insert plan with 2 labels

ESP60323



Bell Jar Kit

Vacuum chamber complete, 1000 ml, with manometer, Syringe plastics, 120 ml, for vacuum-experiments, Vacuum hose plastics, SE, 300 x 6 mm, Signaller (alarm annunciator), Alarm with LED, Hand Pump

ESP60326

NEW

Bell Jar Knobbed 8x4"

Made of Soda glass, with a knob at the top, and ground flange. Size : 20 X 10cm (height × diameter)

ESP60324

NEW

Bell Jar With stopper

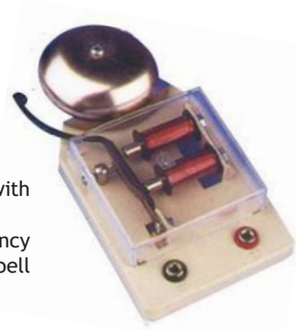
ESP60325

NEW

Bell Jar Knob bed With Base and Electric Bell

Diameter is 19cm,height is 29cm Bell Material: glass It's usually in combination with pump.
To demonstrate that non-transmission of sound in a vacuum

ESP60324

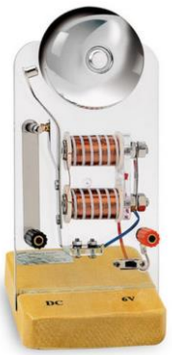


Electric Bell

- Electromagnetic bell with plastic base, for 3-6 V DC
- Complete with transparency cover to observe the way bell worked
- Terminal 4mm socket

Dimensions : (L) 16.00 x (W) 8.00 x (H) 4.00cm
Weight : 0.211 kg

ESP60329



Electric Bell Kit

Teach students how circuits work with this fully exposed bell! This device rings out when an electrical circuit is completed. Includes: wood stand, banana plug jacks, adjustable hammer, and instructions.

Requires an energy source such as a hand generator or a 6V battery kit. Grade 6 and up.

ESP60330

NEW

Electric Bell

ESP60328

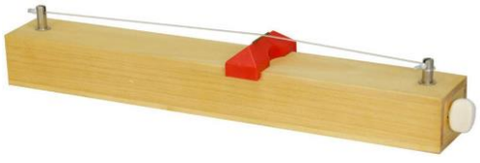
NEW

Electric Bell Demo

Mounted on panel, large size parts and visible wiring. used for Demonstration

Operates on 4-6 Volts.

ESP60331



Sonometer 30 Cm

Ideal for use by Primary School students aged 6-12 years. The student will be able to understand the basic concepts of sound and the vibration of an objects that produce sound.

Experiment topics: Generation of sound. Strong and weak sound.

ESP60332

Sonometer 1 M

Used to demonstrates the relationship between the frequency of the sound produced by a plucked string, and the tension, length and mass per unit length of the string.

Dimensions : Overall sonometer : 1200 x 130 x 80 mm, with bridges at 1000 mm ; Scale : 0-100 cm (1 m), on both sides ;String : 0.5 and 0.7 mm
Material : Sonometer box : Wood - String : Brass and Stainless Steel
On the surface of the box can be stretched three strings wire
Complete with 2 stress string regulator, pulley for drape the load three removable bridges and 1 set of strings ;Used with Slotted Masses and Hanger 6 Steel that are sold separately. **Dimensions :** (L) 115.00 x (W) 12.00 x (H) 9.00 cm ;**Weight :** 3.000 kg

ESP60334

Sonometer Spare String (Wires)

1M These strings are used together with Sonometer. **Dimensions :**
Brass string : 0.5 mm, ,Stainless steel string : 0.7 mm, Length : 1.5 m, Material : Brass and stainless steel, Set consist of 2 brass string and 2 stainless steel string, Part of Sonometer 1 m (ESP60334).,**Dimensions :** (L) 9.00 x (W) 9.00 x (H) 0.50 cm ;**Weight :** 0.025 kg

ESP60335

NEW

Rubens Resonance tube

For an impressive illustration of standing waves and for calculating the speed of sound in gases;In contrast to the Kundt tube, the density differences in the gas are clearly visible from afar through different flame heights;Robust metal tube, with 70 openings at a distance of 10 mm for gas outlet;A loudspeaker is mounted on one end of the pipe, a regulating valve for valve cartridges on the opposite end,the pipe is mounted on a black base and back plate so that the flame heights can be seen in high contrast ;Speaker: 2 W, 8 Ohm ; Dimensions (tube): D=50 mm, L=approx. 860 mm ;Dimensions (total): 86x14x23 cm ; Mass: 4250 g ;Additionally required: valve cartridge function generator

ESP60336

NEW

Resonance Tube Simple

Comprising two brass tubes telescoping into each other so that the column of air within the tube may be altered from 30 cm to 53 cm, outer tube fits into a bas

ESP60337

NEW

Weight for Sonometer

A set of slotted iron masses suitable for use with sonometers or other applications where a large load is required. The masses and hanger are finished in black color. Weights slots are stackable. Five-piece set consists of one each ½ kg. Cap. total 2.5kg. SUPERIOR (Steel)

ESP60335/W

Junior High School

Senior High School

NEW

Sound Resonance Experiment Kit

ESP60346

- The Sound Resonance Experiment Kit is designed to observe the phenomena
- that happens between sound waves and closed tube. If the magnitude of the sound wavelength, speed of sound wave, and the length of the closed tube is fitting, sound resonance will occur. Moreover, this kit have all the required component to measure the speed of sound.
- This kit consists of tuning fork, and 'electronic' tuning fork (frequency generator) that can produce four frequency values so that the experiment can be conducted more easily.

Component List

Weight: 8.160 kg.

Cat. code	Component	Description	Qty
PWS 161	Resonance Apparatus	Consists of a glass tube attached to a vertical rod, hose, and reservoir. Glass tube size: Ø 40 x 1200 mm. Tube material: Borosilicate glass	1 pc
FGE 21	Tuning Fork	Used as a sound source. One set consists of 4 tuning forks with the following frequencies: C: 512 Hz A: 426.6 Hz F: 341.3 Hz D: 288 Hz The tuning fork is stored in a wooden box.	1 set
FGE 22.01	Tuning Fork Hammer	Used to hit the tuning fork to produce a sound.	1 pc
PWV 170	'Electronic Tuning Fork /Frequency Generator	Produces a sound with the same frequency as an ordinary tuning fork, which is 288 Hz; 341.3 Hz; 426,6 Hz; 512 Hz. 3 V voltage source, operated using a push switch.	1 pc

Experiment Topics : E1 Sound Resonance

Resonance Apparatus 1

Consists of a chrome plated metal resonance tube 100 cm long, metal reservoir 250 ml and a meter scale mounted on a metallic stand. With rubber tubing.

ESP60338

Resonance Apparatus 2

The main part of the apparatus is a borosilicate glass tube which is connected to a bulb using a hose to enable to length of the air column in the tube to be varied.

The apparatus is mounted on a stand. It is used to determine the velocity of sound in air by resonance method.

Dimensions :

Tube **Dimentions :** dia. 30 X 850 mm

Tendon volume : 500 ml

Dimensions : (L) 123.00 x (W) 15.00 x (H) 18.00 cm

Weight : 9.000 kg

ESP60339

Resonance Tube, Set

Resonance tube gives the easy of experiment about sound. Loudspeaker which is connected to the audio generator produces stable wave pattern with changeable sound frequency.

Dimensions : Overall 1185 x 100 x 150 mm

Material : Flexiglass

Consist of :

Resonance Tube 1 pc, Microphone 1 pc, Sound Level Meter 1 pc

Additional tools (sold separately) :

- Audio Frequency Generator (ESP60296) - Oscilloscope

Dimensions : (L) 122.00 x (W) 16.00 x (H) 14.50 cm

Weight : 2.475 kg

ESP60340

Resonance Tube Set With Aluminium Case

Resonance tube gives the easy of experiment about sound. Loudspeaker which is connected to the audio generator produces stable wave pattern with changeable sound frequency.

Dimensions : Overall 1185 x 100 x 150 mm

Material : Flexiglass

Consist of :

Resonance Tube 1 pc

Microphone 1 pc Sound

Level Meter 1 pc

Aluminium Case 1 pc

Additional tools (sold separately) :

Audio Frequency Generator (ESP60296)

Oscilloscope

Dimensions :(L) 0.00 x (W) 0.00 x (H) 0.00 cm

Weight :0.000 kg

ESP60341

NEW

Audio Frequency Amplifier

Amplifier one channel which is equipped with microphone amplifier and major output regulator.

• Mode/power output : Mono/10 W • Input impedance (IN) : 600 ohm • Output impedance : 8 ohm • Working voltage amplifier : ± 18 VDC/220 VAC • Features : Microphone mode (Condensor/Dynamic), MIC Input, Volume Control, Power switch, Fuse 0.75 A, Connecting cable AC, AC connector selector, and Output • Size : Overall 185 x 130 x 75 mm.

ESP59126

Sound Level Meter

Hand Held small Sound meter analogue type to be used for resonance tube.

ESP60347

Sound Level Meter Mini

Mini Analogue sound level meter range up to 130 dp

ESP60348

Junior High School
Senior High School

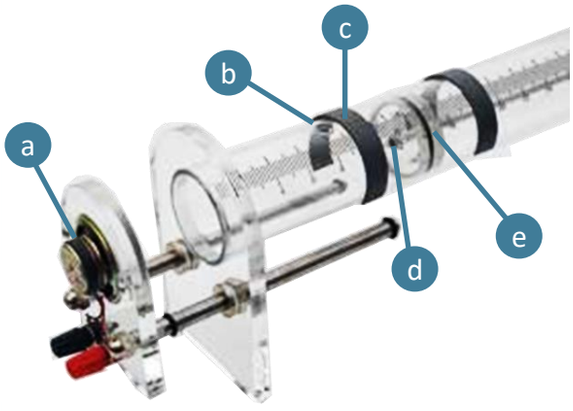
Resonance Tube
ESP60342

- Resonance tube provides an easy experiment of sounds.
- ®® Loudspeaker which is connected to the audio generator produces stable wave pattern with
- changeable sound frequency.
- ®® Equipped with Sound level meter (SLM) to observe the wave node and antinode position in
- the resonance state.
- ®® By connecting the microphone to the oscillator, wave pattern is better and easily determinable.
- ®® This apparatus is used to find out sound wave on both opened and closed tube, and to observe
- the stationer sound wave pattern inside the tube by the oscilloscope.

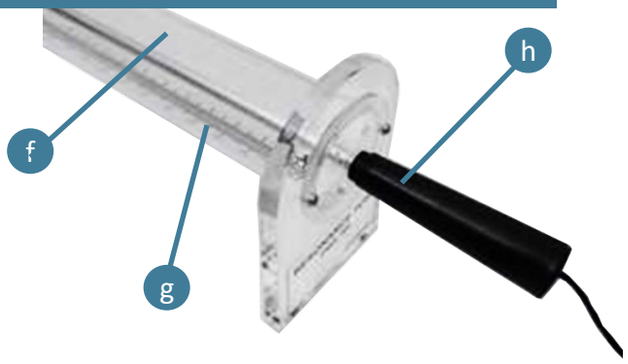
Component List

	Cat. code	Description	Qty
A	PWS 160 01 161	Resonance Tube	1 set

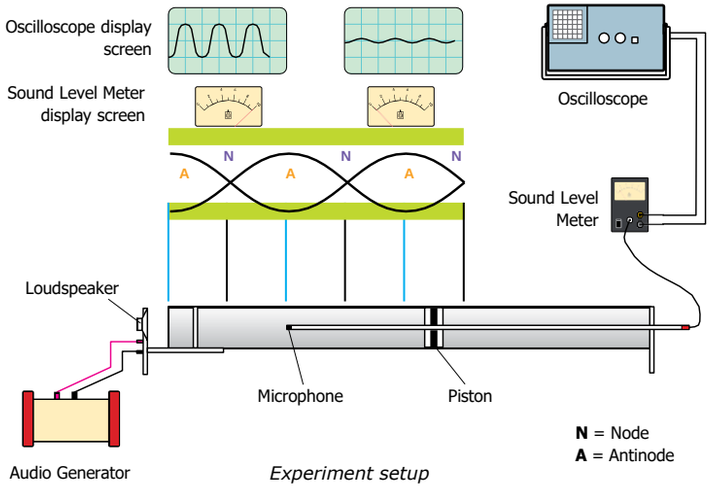
a	Loudspeaker Loudspeaker is mounted on plexiglass foot; movable around the open end of the tube
b	Wind Musical Instrument Hole There is a pair of holes to observe the influence of the opened and closed hole on the wind musical instrument. These holes can be shut by its shutter when the hole is not in use.
c	Hole Ring Cover Two slip ring covers are provided to close the hole for performing other experiments.
d	Microphone Mounted on the end of position adjuster rod to make it easier when finding the position of the node and antinode inside the tube; microphone is connected to an oscilloscope
e	Piston Piston is used to adjust the length of the tube. It can be easily moved inside the tube by the position adjuster rod.



	Cat. code	Description	Qty
f		Tube Fine quality plexiglass tube, equipped with milimeter graduation to make it easy to find out the length of the tube and the microphone position	
g		Graduated Tube To easily facilitate the tube measurement length and to determine stationer wave nodes and antinodes inside the tube.	
h		Position Adjuster Rod This rod is used to adjust the position of the piston and the microphone.	
B	PWS 160 02	Microphone	Microphone is mounted on the end of the position adjuster rod to make it easy to find the position of standing wave node and antinode inside the tube. Microphone is connected to an oscilloscope through an amplifier unit.	1 pc
C	PWS 160 03	Sound Level Meter	Consisting of analog meter to show the sound strength (amplitude) in 0 – 10 scale. Equipped with microphone amplifier to make it visible on the oscilloscope; battery operated, 9 volt.	1 pc



Node and Antinode on the Resonance State



Experiment setup

Sound Level Meter

Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. Code	Tool	Qty
ESP60296	Audio Frequency Generator	1 pc
GME 236	Oscilloscope 30 MHz, Eduscope 3000	1 pc

Experiment Topics

Experiment 01	Resonant Frequencies of a Tube
Experiment 02	Standing Wave in a Tube
Experiment 03	Speed of Sound in Air Wind
Experiment 04	Instrument

Experiment 02 Standing Wave in a Tube

Resonance Tube And Complements, Set

Resonance Tube and Complements, Set

Consists of:

(ESP60340) Resonance Tube Set 1 pc
(ESP60296) Audio Frequency Generator 1 pc Oscilloscope 1 pc
Connecting Lead DC 50 cm, Black 2 pcs Connecting Lead DC 50 cm, Red 2 pcs Manual Book 1 exp

RESONANCE TUBE SET (ESP60340)

Resonance tube gives the easy of experiment about sound. Loudspeaker which is connected to the audio generator produces stable wave pattern with changeable sound frequency.

Dimentions : Overall 1185 x 100 x 150 mm, Material : Flexiglass

Set Consist of : Resonance Tube 1 pc, Microphone 1 pc, Sound Level Meter 1 pc

Dimensions : (L) 122.00 x (W) 16.00 x (H) 14.50 cm, **Weight :** 2.475 kg **AUDIO FREQUENCY GENERATOR**

ESP60296

A tool wave signal generator, which produces a square wave, sinusoidal, triangle, saw, and pulse. 8 output impedance with enough power to drive the Vibration Generator (ESP60299) and Loudspeaker with Wood Holder , output to input to the Audio Frequency Amplifiers . Frequency Range : 0.1 Hz - 110 kHz, Distortion sinus wave is less than 2% (1kHz), Maximum output power : 3 watts at 8 load, Input Voltage 110/220 VAC, Protection fuse (fuse) : 0.5 A (him. 5 x 20 mm),

OSCILLOSCOPE 30 MHZ

Measuring limit : 30 MHz, The number of canals : 2, The rate of footage : 250 MS/s and 10.000 point recording data, Screen : Coloured TFT LCD 8 inch, Resolution : 800 x 600 pixels, Operating X-Y, Input voltage : 220V, Equipped with VGA terminal to connect oscilloscope with a projector as well as USB terminal communication and LAN to be connected to a computer Result of measurement/waveform can be stored in internal memory or flash disk Oscilloscope can also record the signals and replay the record. There are auto-scale function, FFT function , mathematical function to operate a signal of the two canals and 20 variable automatic measurements function Equipped with guidelines on menu “Help” Complete with probe intensity and manual book

ESP60343

Sound Velocity Meter

For measuring sound velocity through solids, liquids or gases; 4-digit, 26- mm LED display; signal is launched manually; stop signal detected by encapsulated electric microphone with waterproof membrane.

TECHNICAL DATA : Measuring range: 99.99 ms, Accuracy: 10 µs, Dial for adjusting sensitivity, Reset switch, Power supply: 4 x 1.5 V Mignon cells (included), rechargeable cells or external power supply 6 V / 500 mA, P3120-6N, Case: plastic, ABS, Case **Dimensions :** approx. 160 x 120 x 45 mm, Length of probe leads: approx. 150 cm each

ESP60345

Speed of Sound Kit

The forks have threaded shanks and will screw in the box tops. Frequency of each is A (426). One fork is fitted with a sliding mass to alter its frequency. On sounding both forks, a clear ‘beat’ is produced. Supplied with one hammer. Size of box 180 x 88 x 53 mm approx.

ESP60344

Tuning Fork Pair With Resonance Box

The forks have threaded shanks and will screw in the box tops. Frequency of each is A (426). One fork is fitted with a sliding mass to alter its frequency. On sounding both forks, a clear ‘beat’ is produced. Supplied with one hammer. Size of box 180 x 88 x 53 mm approx.

ESP60350

Tuning Fork On Resonance Box

pair of tuning forks with frequency y of 426.6 Hz, mounted on resonance box in the dimension of 180 × 90× 50 mm. One of the tuning forks has an frequency adjuster on one of its leg which can be shifted up and down. It is equipped with a rubber club.

ESP60351

Microwave Apparatus with Goniometer

ESP60312

- Microwave apparatus with goniometer is a set of tools which are used to learn the electromagnetic wave.
- Diffraction and interference experiment on the electromagnetic wave are very difficult to perform on the visible light wave length. With this apparatus, those characteristics can be easily observed.
- Reflection law experiment, diffraction on single slit, interference on double slits, polarization and Michelson interferometer can be performed by this apparatus.
- With goniometer, the setting of experiments that require a certain angle can be done easily.

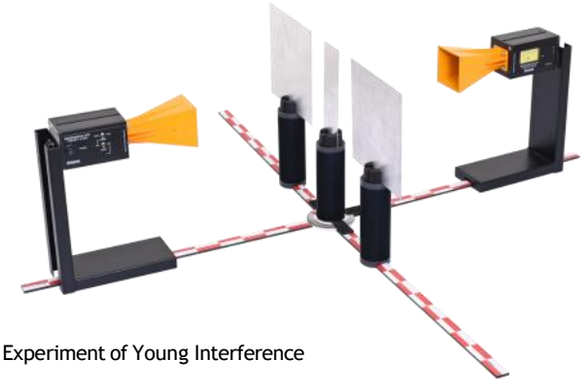
Component List

Cat. code	Component	Description	Qty
a PS000397	Transmitter	The 3 cm micro wave transmitter is a device that transmit radio wave (electromagnetic wave) at wavelength 3 cm. The wave characteristic is made in such way to make it resemble the characteristic of the light beam, thus this radio wave propagates in straight line.	1 pc
b PS000398	Receiver	The 3 cm micro wave receiver is a device that able to detect the presence of radio wave's shape which is transmitted by a transmitter. It is equipped with amplify mode to detect the weak wave.	1 pc
c TL000413	Transmitter and Receiver Stand Base	These are used as the transmitter and receiver seats. The bases are made of L-shape aluminum. There is a gap in the bottom side to slide the gonimometer.	2 pcs
d ESP 50/04	Aluminum Sheet 210 x 210 mm	This is used as micro wave reflector	2 pcs
e ESP 50/05	Aluminum Sheet 60 x 210 mm	This is used as a barrier in double slits interference (Young) experiment.	1 pc
f ESP 50/06	Plastic Sheet	This is used as half mirror reflector	1 pc
g ESP 50/07	Wire-grid Polarizer	This is used in polarization experiment	1 pc
H ESP 50/08	Plastic Stand Base	This is used to support the aluminum sheet, plastic sheet, and wire-grid polarization	3 pcs
I ESP 00085	Goniometer	Goniometer is an instrument to measure the angle of an object that being rotated to a precise angular position. The center part of goniometer keeps steady when the arm is rotated. It consists of one arm with protractor and one rotation arm	1 pc
J ESP 00414	Additional Arms of Goniometer	These are used as the additional rotation arm to make four angles in goniometer. These arms are used in one slit diffraction experiment, two slits diffraction experiment, and Michelson interference	2 pcs

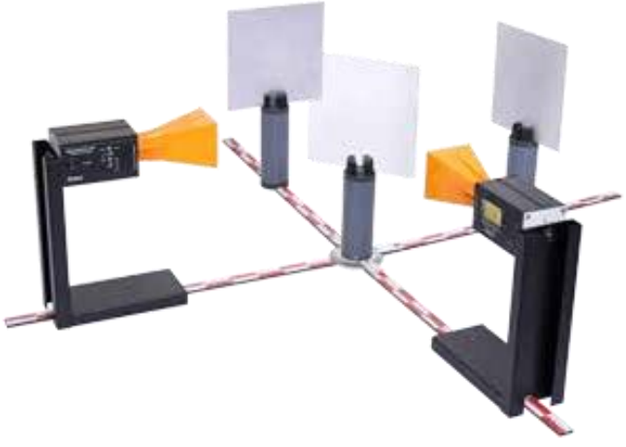
Cat. code	Component	Description	Qty
k ESP 00411	Extension of Plastic Stand Base –Center Part	This is used to support the plastic stand base, so that the center part of aluminum sheet,plastic sheet, or polarizer is parallel with the transmitter and receiver. Extension of plastic stand base in center part is placed in the center part of angular scale pointer.	1 pc
l ESP 000412	Extension of Plastic Stand Base –Side Part	This is used to support plastic stand base for aluminum sheet in one slit diffraction and Young interference experiment, so that the height of sheet is parallel with the transmitter and receiver. There is a gap in the bottom of extension so it can be placed in additional arm of goniometer.	2 pc
m ESP 000415	Plastic Head Bolt	This is used to install transmitter and receiver in the stand base	2 pcs
N ESP 00399	DC Power Supply Adapter for the Transmitter	This is the adapter cable to power the transmitter. This adapter uses voltage 12 V and current 1,2 A.	1 pc
o ESP 00326	Charger USB Cable for the Receiver	This is used to charge the receiver battery	1 pc

Experiment Topics

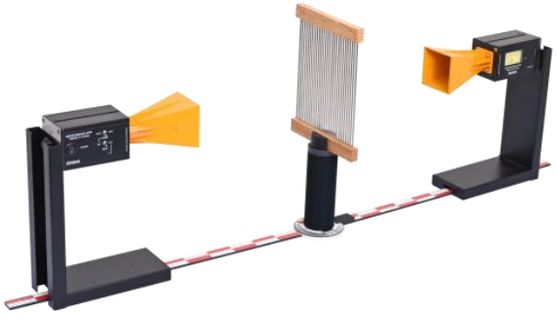
- E1 Reflection
- E2 Interference
- E3 Difraction
- E4 Polarization



Experiment of Young Interference



Experiment of Michelson Interference



Experiment of Polarization

NEW

Tuning Fork Pair With Resonance Box 256 HZ

The forks have threaded shanks and will screw in the box tops. Frequency of each is 256 HZ. One fork is fitted with a sliding mass to alter its frequency. On sounding both forks, a clear 'beat' is produced. Supplied with one hammer. Size of box 180 x 88 x 53 mm approx.

ESP60349

NEW

Tuning Forks (5 PCS/SET)

Turning Fork (5 pcs/set) Used in some experiments about sound, waves or other physical experiments Overall size: 160 x 95 x 25mm Material: Steel Equipped with a wooden box for storage of tuning fork and rubber mallet The set consists of different frequencys : 128HZ,256HZ,320HZ,384HZ,512HZ

ESP60353

NEW

Tuning Forks (13 PCS/SET)

Set of 13 Tuning Forks, in Wooden Case Made of Steel (+ / -) 5% of stated frequency Designed for Physics Experimentation Perfect for sound study

ESP60354

Colour Mixing Apparatus

This self contained unit ideal for demonstration color mixing with the addition of the three primary colours : red, blue,and green. The brightness of the three colours can be controlled by individual switches. Hundred of color combinations are possible, 3 inch screen , require AA batteries (not included)or connect to power supply.

ESP60357

Colour Mixing Demonstration Projection

A low voltage projection colour mixing apparatus. The unit comprises three individually moveable light heads, red, blue and green, which use individual lenses to project three coloured spots of light. By adjusting the heads the spots may be overlapped to produce the classic colour mixing pattern or superimposed to give a white disc that may be used for colour shadow work and secondary colour mixing determination. All three colours may be individually adjusted from 0% to 100% giving an almost limitless number of possible colours. Comes supplied with low voltage power supply.

ESP60359

Tuning Fork (4 Pcs/Set)

Turning Fork (4 pcs/set) Used in some experiments about sound, waves or other physical experiments Overall **Dimensions :** 160 x 95 x 25mm Material: Steel Equipped with a wooden box for storage of tuning fork **The set consists of:** C 512 Hz - A 426.6 Hz - F 341.3 Hz - D 288 Hz - **Dimension:** 18.00 (L) x 17.00 (W) x 5.00cm (H) - **Weight:** 0.500kg

ESP60352

NEW

Tuning Forks (8 PCS/SET)

Set of 8Tuning Forks, in Wooden Case Aluminum alloy With rubber mallet

256Hz、288Hz、 320Hz、 341Hz、384Hz、426Hz、480 Hz、512Hz

ESP60353/8

NEW

Microphone

Piezo - electric crystal microphone, frequency response 60 to 10,000 Hz. Complete with 1.4 m screened lead, terminals and jack plug. General purpose piezo - electric crystal microphone, frequency response 60 to 10,000 Hz. Complete with 1.4 m screened lead, terminals and jack plug

ESP60355

Colour Mixing Apparatus Demo

The Irwin Colour Mixing kit is designed to demonstrate primary and secondary colour mixing.

The kit comprises, essentially, a scaled up version of our small colour mixing apparatus. A robust, upright case contains three, high powered accurately colour matched LEDs, each of which has infinitely adjustable brightness. Also supplied is a large, free-standing, primary colour shadow mask, a hand held secondary colour mask and a 12V plug top power supply.

The system allows the teacher to project large primary and secondary colour mixing disks onto any vertical surface and to adjust the colour saturation to mix virtually any colour (How do you produce brown?). Unlike other systems the purity of the resulting white is outstanding. The unit is extremely easy to use, is easily transportable and comes with full instructions. The only other requirements are a white wall and a darkened/blacked out room. The system may be used to demonstrate both secondary and primary colour mixing, colour shadows and colour reflection/absorption.

ESP60358

Newton Colour Disc With Motor ,Demonstration.

Large size, mounted on moulded ABS base. Operates on 4 to 6 Volts DC with Newton's Color Disc.

ESP60362

Newton's Colour Disc Motor Driven

Newton disc 75mm dia. Mounted on the axle of the small motor, which is fitted on a plastic base-plate with connection sockets. Operates on 4-6 Volts DC.

ESP60361

Coloured Filters (Pk6)

mounted in plastic frames 50mm x 50mm. Suitable for use in optical boxes etc. While not suitable for photographic Work

ESP60364

NEW

Newton Colour Disc

To show that mixing of spectrum colours produces (nearly) white colour.

Dimensions : Colour Disc: 250mm dia - Pulley: 25mm dia and 108mm dia

Material: Disc and Pulley: Plastic - Support Rod: Steel Disc divided into 2 sector each with 7 different colours Mounted on a rotator and stand base A-shaped Producing nearly white colour when the disc is rotated Used with Pulley 100mm dia, Plastic

ESP60363

Optics Kit,Eduscience Prim (Set Of 1)

Ideal for use by Primary School students. The students can design their own experiments. This kit is used in learning the basic concepts and characteristics of prism and magnifying effect of a magnifying glass. Experiment topics:Decomposition of light., Magnifying effect of glasses. Prism behaviour.

Specification:The kit contains 1pc x prism and 1pc x magnifying glass.**Dimensions :** (L) 5.50 x 9W) 14.00 x (H) 1.50cm

ESP60391

Spectrum Tube Power Supply I

Specially designed box holds the tube firmly and prevents the student from touching the electrodes. A black panel behind the Spectrum tube eliminates distracting ambient light and protects the tube from breakage. Operates on 220V A/C at 50Hz and is suitable for 20/26 cm tubes.

ESP60377

NEW

Halogen Light Source

Equipped with 12 V, 21W Halogen bulb on stand , a rod including a luf , ensue the positioning of the light source on the base including stand and power unit

ESP60382

NEW

Camera Obscura Pin Hole

To illustrate the principle of image formation due to light rays passing through small apertures. Comprising a polished wooden box with a ground glass screen at the rear end and an adjustable sliding front with a hole. Made of steam beach.

ESP60386

NEW

Pin Hole Camera Kit

Includes: (8) 15x10x10cm cardboard boxes with hole, (1) Filament lamp, (50) sheets of black paper 20x25cm, (1) Mounter lamp holder with flex, (1) Packet of pins, (1) Set of Instructions

This is a physics experiment kit that is used to show the principles of a pinhole camera. Uses cardboard boxes with light sources, lens, and paper to demonstrate a pinhole camera. Contains (8) Cardboard boxes 150 x 100 x 100 mm with hole, screen and lid, filament lamp, 50 sheets of black paper 200 x 250 mm, one 60 watts lamp, one mounted lamp holder with flex, one packet of pins

ESP60385

Spectrum Tube Power Supply II

High voltage power supply for spectrum tube. Equipped with spectrum tube holder,

Input voltage: 110/220VAC

Voltage output: 3 kV, 5mA (The output is continuously variable and is properly insulated)

Dimensions : 24.00 (L) x 18.00 (W) x 31.00 (H) cm

Weight : 3 kg

ESP60379

Spectrum Tubes

Made of glass, 26cm long overall, narrowed to capillary width for 8.5 to 10cm of the length. Metal wires holding the electrodes are sealed through the ends and welded to metal caps, which have loops for connecting wires.

ESP60366	Oxygen	ESP60370	Argon	ESP60374	Sulphur
ESP60367	Neon	ESP60371	Carbon Di Oxide	ESP60375	Xenon
ESP60368	Helium	ESP60372	Hydrogen	ESP60376	Krypton
ESP60369	Nitrogen	ESP60373	Iodine Vapour		

Senior High School

Optics Kit
ESP60392

- The guide book consists of 23 experiments.
- The experiments are related to the principle of propagation, reflection,
- refraction, object image, microscope, and other optic experiment

Component List

Consists of 51 components, packed in a plastic injection moulding box.
Dimensions: 61 × 44 × 16 cm. Weight: 5.64 kg.

Cat. code	Component	Qty
FPT 16.01/65	Optic Table	1 pc
FPT 16.02/66	Precision Rail 50 cm	3 pcs
FPT 16.03/67	Rail Connector	2 pcs
FPT 16.04/68	Foot for Rail	2 pcs
FPT 16.06/76	Lamp Housing with Festoon Bulb	1 pc
FPT 16.06/76-272	Festoon Bulb 12V, 18W	2 pcs
FPT 16.07/77	Diaphragm Slide Holder	1 pc
FPT 16.08/78	Diaphragm 5 Slit	1 pc
FPT 16.09/79	Diaphragm 1 Slit	1 pc
FPT 16.25/95	Diaphragm Arrow	1 pc
FPT 16.12/82	Translucent Screen, 110 x 100 mm	1 pc
FPT 16.13/83	Convex Lens with Holder, f = +50 mm	1 pc
FPT 16.14/84	Convex Lens with Holder, f = +100 mm	1 pc
FPT 16.15/85	Convex Lens with Holder, f = +200 mm	1 pc

Cat. code	Component	Qty
FPT 16.16/86	Concave Lens with Holder, f = -100 mm	1 pc
FPT 16.17/87	Clamp Rider	4 pcs
FPT 16.18/88	Semi Circular Lens Ø 60 mm	1 pc
FPT 16.19/89	Prism Right Angle 30 x 30 x 40 mm	1 pc
FPT 16.22/92	Biconvex Lens, Glass	1 pc
FPT 16.23/93	Combination Mirror	1 pc
FPT 16.24/94	Biconcave Lens, Glass	1 pc
FPT 16.26/98	Glass Block 60 x 40 x 20 mm	1 pc
FPT 16.11/81	Candle Holder	1 pc
MGE 100 03	Rectangel Plastic Tank	1 pc
MGE 100 04	Square Plastic Tank	1 pc
POG 100 03	Mirror Concave with Holder, f = +100 mm	1 pc
POG 120 03	Mirror Convex with Holder, f = -100 mm	1 pc
FPT 16.07	Slide Cover	2 pcs

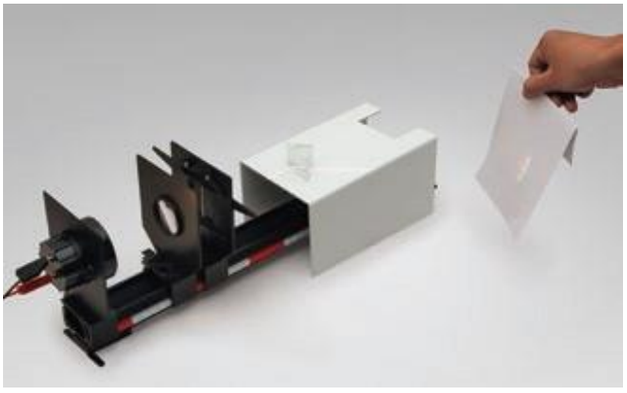
Supporting Tools

For detailed information, please refer to page 70 - 73.

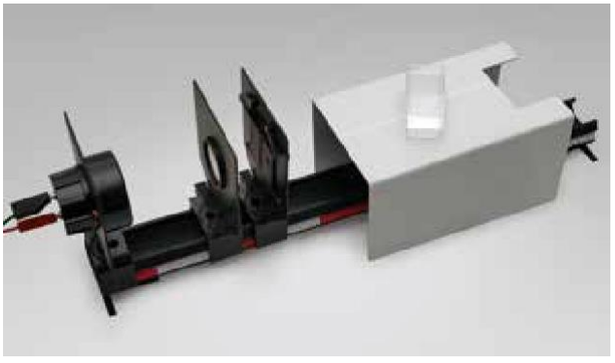
Cat. code	Tool	Qty
ESP60751	Power Supply	1 pc
ESP 203 03	Folding Flat Mirror	1 pc

Experiment Topics

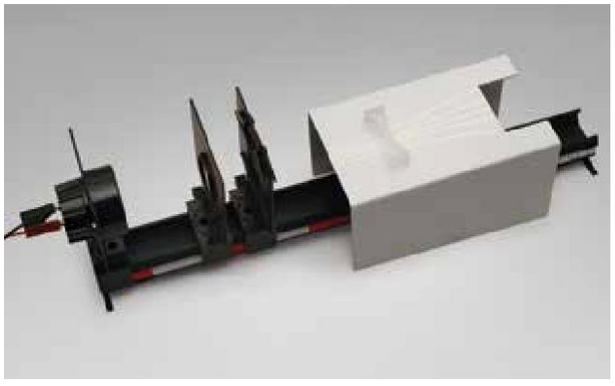
O1	Propagation of Light
O2	Reflection of Light on a Plain Mirror
O3	Reflection of Light on a Folding Plain Mirror
O4	Reflection of Light on a Concave Mirror
O5	Image on a Concave Mirror
O6	Reflection of Light on a Convex Mirror
O7	Image on a Convex Mirror
O8	Refraction of Light on a Semicircular Glass
O9	Total Reflection
O10	Refraction of Light on a Plan-Parallel Glass
O11	Refraction on Liquid Substances O12
O14	Refraction of Light on a Combination Lens
O15	Image by Convex Lens
O16	Object Distance, Image Distance and Focal Length
O17	Dispersion of Light
O18	The Eye
O19	Eye Defects
O20	Magnifying Glass
O21	Astronomical Telescope
O22	Microscope
O23	Optical Illusions



O8 Refraction of Light on a Semicircular Glass



O11 Refraction on Liquid Substances



O13 Refraction on Concave Lens

O16 Object Distance, Image Distance and Focal Length

NEW

Simple Optics Set

Simple Optics Set consist of 3 V-shape Wooden lens holder , white screes,2 plan mirrors , glass sheet , plastic beaker , 2 prims , 2 lenses / mirror support , flashlight , candle , set of 5 color filters , 2 convex lens and concave lens , Pla NO convex lens

ESP60388

OPTICS & EYE KIT

kit consisting of :
(01) Square sink with Magnetic
Frosted glass
(02) Rectangular glass brick
(03) Triangular prism
(04) Optical experiment device
Round sink with Magnetic
Transflectoscope
(05) Color filter set
(06) Battery case with Magnetic
(07) Single line laser source with Magnetic
(08) Three-wire laser source with Magnetic
(09) Curved receiving screen, magnetic
(10) Semicircular lens, magnetic
(11) Double convex lens,f=+50mm,magnetic
(12) Double concave lens,f=-75mm,magnetic
(13) Double convex lens,f=+75mm,magnetic
(14) Double concave lens,f=-300mm,magnetic

NEW

(15) Double convex Lens,f=+100mm,magnetic
(16) Plane mirror, C-shaped,magnetic
(17) Plane mirror, magnetic
(18) Plano convex lens,F=+300mm,magnetic
(19) Double convex lens,f=+300mm,magnetic
(20) Double convex lens,f=+150mm,magnetic
(21) Cross slot
(22) Flat mirror base
(23) Laser pointer
(24) Rectangular triangle

ESP60396C

NEW

ESS OPTICS KIT 1 PC

Propagation of light
OP-1 Light propagation rectilinearly
OP-2 Shadow
OP-3 Core shadow and half shadow
OP-5 Solar and lunar eclipses
Mirrors
OM-1B Reflection of light
OM-1 Reflection of light on a plane mirror
OM-2 Object and image on a plane mirror
OM-3 Reflection parallel rays on a concave mirror
OM-4 Image of a point object formed by a concave mirror
OM-7 Reflection of parallel rays on a convex mirror
OM-8 Image of a point object formed by convex mirror
Refraction
OR-3 Refraction of light
OR-3A Determining the refractive index of glass
OR-2 Refraction at the transition from air into water
OR-2A Refraction at the boundary between two liquids
OR-2B Refraction at the glass-air boundary
OR-4 Total reflection
OR-1 Refraction of light on plain parallel surface
OR-5 Refraction trough a prism
OR-5A Deviating prisms
OR-5B Reversing prisms

Lenses
OL-1 Refraction at convex lenses
OL-2 Construction of image formed by a convex lens
OL-6 Refraction at concave lenses
OL-7 Construction of concave lens image
OL-7A The three “special rays” on concave lens
OL-10 Focal length of lens combinations
OL-3 Spherical aberrations
OL-11 Chromatic aberration
Colour
OC-5 Colour dispersion with a prism
OC-6 Reunification of spectral colours
OC-7 Complementary colours
OC-2 Colour mixing
OC-8 Subtractive colour mixing
OC-3 Colours of object
The human eye
OE-1 The eye OE-2 Short sightedness
OE-3 Long sightedness
OE-4 Optical illusions
OE-5 Defective accommodation in old age and its correction

ESP60390

International Optics Kit
ESP60396

- The apparatuses are precisely designed for easier experiment setup and successful result.
- The guide book consists of 49 experiments.

Component List

Consists of 51 components, packed in a plastic injection moulding box.
Dimensions: 61 × 44 × 16 cm. Weight: 5.64 kg.

Cat. code	Component	Qty
POG 460 01	Ray Box with Halogen Lamp, 12 V, 20 W	1 pc
POG 460 02	Ray Box Holder	1 pc
POG 250	Semi Circular Lens, Ø 76 mm	1 pc
POG 310 02	Prism, Trapesoid	1 pc
POG 310 01	Prism, Right Angle	1 pc
POG 240 01	Plano-Convex Lens	2 pcs
POG 260 01	Plano-Concave Lens	1 pc
POG 400 01	Optical Disc with Graduation POG 700	1 pc
POG 700	White Screen, 100 × 110 mm	1 pc
FPT 16.23/93	Combination Mirror	1 pc
POG 460 03	Diaphragm, 1 and 3 Slits	1 pc
POG 460 04	Diaphragm, 1 Wide and 5 Slits	1 pc
POG 350	Hollow Plastic Tank	1 pc
POG 320	Prism, 10°	1 pc
FPT 16.06/76	Lamp Housing with Festoon Bulb	2 pcs
POG 050	Earth Moon Model	1 pc
FPT 16.07/77	Diaphragm Slide Holder	2 pcs
FPT 55/20	Prism, Equilateral Triangular	1 pc
POG 550 02	Circular Disc in Mount	1 pc

Cat. code	Component	Qty
FPT 16.12/82	Translucent Screen	1 pc
POG 550 04	Slide Model	1 pc
POG 550 03	Slide with Hole set of 4	1 pc
FPT 16.25/95	Diaphragm Arrow	1 pc
FPT 16.07	Slide Cover	2 pcs
FPT 16.09/79	Diaphragm 1 Slit	1 pc
POF 310	Slide for Polarization	1 pc
POF 180 01	Diffraction Grating	1 pc
POF 550	Cuvette Plastic	1 pc
POF 600	Photoelastic Solid	1 pc
POF 225	Colour Filter, RGB-CMY	1 pc
FPT 16.03/67	Rail Connector	1 pc
FPT 16.04/68	Foot for Rail	2 pcs
FPT 16.02/66	Precision Rail	2 pcs
POG 100 01	Concave Mirror with Holder, f = + 75 mm	1 pc
POG 120 02	Convex Mirror with Holder, f = - 150 mm	1 pc
POG 120 01	Convex Mirror with Holder, f = - 75 mm	1 pc
POG 120 02	Convex Mirror with Holder, f = - 150 mm	1 pc
FPT 16.13/83	Convex Lens with Holder, f = +50 mm	1 pc

Cat. code	Component	Qty
FPT 16.14/84	Convex Lens with Holder, f = +100 mm	1 pc
POG 200 01	Convex Lens with Holder, f = +300 mm	1 pc
FPT 16.16/86	Concave Lens with Holder, f = -100 mm	1 pc
POG 220 01	Concave Lens with Holder, f = -300 mm	1 pc
POG 680	Prism Table	1 pc
FPT 16.17/87	Clamp Rider	6 pcs
FCA 40	Polarizing Filter with Holder	2 pcs
POG 550 01	Diaphragm Single Hole	1 pc
POG 400 02	Optical Disc with Axle	1 pc
POF 265	Colour Stripe	1 pc
POF 265	Colour Filter RGB	1 pc
POF 265	Colour Filter CMY	1 pc
POF 265	Plain Mirror for Colour Mixing	3 pcs

Supporting Tools

For detailed information, please refer to page 70 - 73.

Cat. code	Tool	Qty
ESP60750	Power Supply 5 A, 12 V	1 pc

Experiment Topics

Propagation of Light

OP-1 Light Propagates
OP-2 Rectilinearly Shadow
OP-3 Core Shadow and Half
OP-4 Shadow Lunar Phases
OP-5 Solar and Lunar
OP-6 Eclipses Pinhole Camera

Mirrors

OM-1 Reflection of Light on a Plane Mirror
OM-1A Reflection of Light on a Curved Mirror
OM-2 Object and Image on a Plane Mirror
OM-3 Reflection of Parallel Rays on a Concave Mirror
OM-4 Image of a Point Object Formed by a Concave Mirror
OM-5 Three “Special” Rays for Image Construction in a Concave Mirror
OM-6 Locating the image of an object formed by concave mirror
OM-7 Refection of Parallel Rays on a Convex Mirror
OM-8 Image of a Point Object Formed by Convex Mirror
OM-9 Three “Special” Rays for Image Construction in a Convex Mirror
OM-10 Image on a Convex Mirror

Refraction

OR-1 Refraction of Light
OR-2 Refraction from Lens into the Air and Total
OR-3 Reflection Refraction of Light on Plain
OR-4 Parallel Surface Refraction at the Transition
OR-5 from Air into Water Refraction trough a Prism

Lenses

OL-1 Refraction at Convex Lenses
OL-2 Construction of Image Formed by a Convex
OL-3 Lens Spherical Aberrations
OL-4 Images by a Convex Lens
OL-5 Object Distance, Image Distance and Focal
OL-6 Length Refraction at Concave Lenses
OL-7 Construction of Image formed by a Concave
OL-8 Lens Image Formed by a Concave Lens

Colors

OC-1 Dispersion of Light
OC-2 Color Mixing
OC-3 Colors of Object
OC-4 Color of an Object when Viewed through Color Filter

The Eye

OE-1 The Eye
OE-2 Shortsighted
OE-3 Longsighted
OE-4 Optical Illusions

OR-1 Refraction of Light

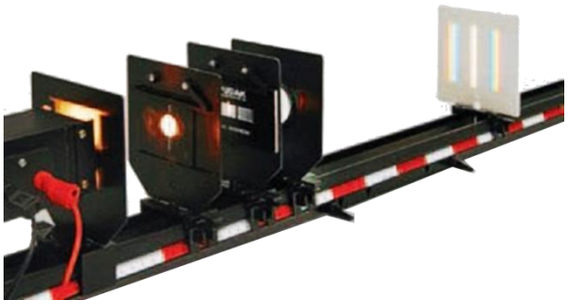
OL-4 Images by a Convex Lens

Optical Instruments

OI-1	Magnifying
OI-2	Glass Slide
OI-3	Projector
OI-4	Microscope
OI-5	Astronomical Telescope Camera

Wave Optics

OW-1	Diffraction by Grating
OW-2	Determination of the Wave Length of Light
OW-3	Polarization of Light
OW-4	Rotating of the Plane of Polarization by Inserting Solid Materials
OW-5	Model of a Saccharimeter
OW-6	Photoelasticity



OW-1 Diffraction by Grating

Component Details

Precision Rail and Connector

a. Precision rail (FPT 16.02/66): 50 cm rail length made of anodized extrusion aluminum, completed with cm and mm graduation label.

b. Rail connector (FPT 16.03/67): for connecting two rails to make it straight and rigid, made of ABS plastic, 20 cm long.

c. Rail foot (FPT 16.04/68). It is mount on the ends of the connected rail, made of ABS plastic.

d. Clamp rider (FPT 16.17/87) is made of ABS plastic. It is used as a movable self-clamping component holder on the rail precision. To loosen and move the clamp, press the two levers on the side.

Geometric Optic Experiment Tools

e. Handled lenses: concave and convex lenses, mounted on ABS plastic frames.

f. Handled mirror: concave and convex mirrors, mounted on ABS plastic fames.

g. Diaphragm slide holder (FPT 16.07/77): plastic frame with spring clamp on both faces, used to hold diaphragm, filter and grating slide.

h. Translucent screen (FPT 16.12/82).

i. White screen (POG 700).

j. Prism table (POG 680), used to put the prism on the precision rail.

k. Cover chips (FPT 16.07), used to adjust the diaphragm opening.

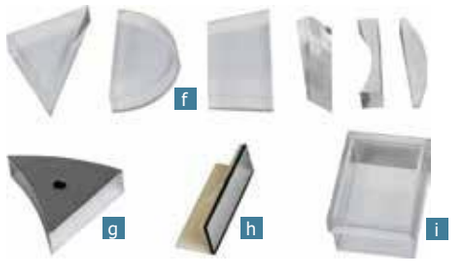
l. Earth-Moon model (POG 050).

Light Source

a. Raybox (POG 460 01): aluminum box completed with cooler fan, halogen bulb 12 volt, 20 watt with condenser lens.
b. Lamp house (FPT 16 06/76). 12 volt, 18 watt bulb is mounted on rotatable holder to adjust the bulb filament position.
c. Diaphragm, 1 slit and 3 slits (POG 460 03).
d. Diaphragm, wide slit and 5 slits (POG 460 04).
e. Raybox holder (POG 460 02) is used to mount the raybox on the precision rail.

Lens, Prism and Mirror

f. Lens and prisms, made of polished acrylic.
g. Combination mirror, made of chromed plastic.
h. Flat mirror (POG 099).
i. Plastic tank (POG 350).

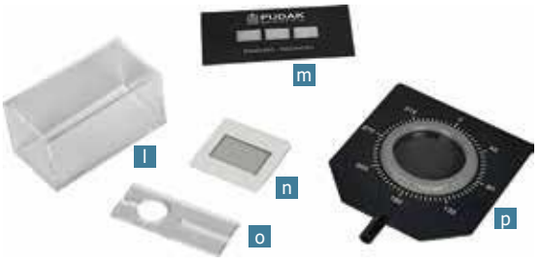


Optical Disc

j. Optical disc with axle (POG 400 02), the disc is rotatable at its axis to show incoming ray angle, refraction angle or to observe the Snell's Law.
k. Graduated optical disc without axle (POG 400 01).

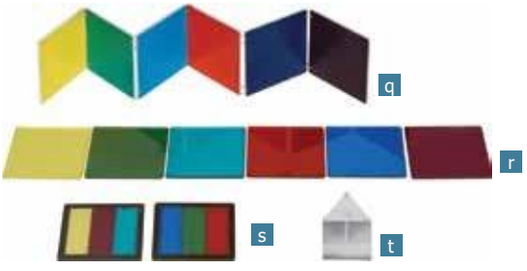
Wave Optics

l. Plastic box (POF 550) is used to observe liquid polarization plane rotation.
m. Diffraction gratting (POF 180 01).
n. Polarization slide (POF 310).
o. Polarization filter (FCA 40) is used to produce polarization ray which can be used to observe the polarization symptom.
p. Photo-elastic object (POF 600) is used to observe the double refraction on pushed or pulled transparent elastic object.



Color Experiment Tools

q. Color chips (POF 265).
r. Color filter, RGB-CMY (POF 225): red, green, blue, cyan, magenta, yellow; made of molded color plastic, dimension 5 × 5 cm.
s. Color filter RGB (POF 210) and CMY (POF 215) are three colors slide RGB and CMY, used in color mixing.
t. Triangular prism (FPT 55/20), dimension 30 × 30 mm.



Slides and Diaphragms

u. Model slide set (POG 550 04).
v. Ray blocker circle (POG 550 02).
w. 4 holes diaphragm (POG 550 03).
x. 1 hole diaphragm (POG 550 01).
y. Arrow diaphragm (FPT 16 25/95).
z. 1 slit diaphragm (FPT 16 09/79), 1 mm slit width.

Optics Kit Panel Type
ESP60398

- Magnetic mounting system for an easy and fast setup.
- ®® Experiment board dimension is 900 × 600 mm, large enough space for the experiment. Components are
- equipped with neodymium magnet. This system result is an easier component arrangement and positioning
- onto the board, such as light source and other optic tools .
- ®® Large optic component gives an optimum geometric visual.
- ®® Xenon lamp produces white and sharp light and lower power consumption rather than halogen.

Component List

Consists of 27 items.
Weight: 23.4 kg.

Cat. code	Component	Qty	Cat. code	Component	Qty
POG 465	Ray Box with Magnet	1 pc	POG 240 03	Lens Model, C-Shaped	1 pc
POG 461	Diaphragm, 1 and 2 slits	3 pcs	POG 245	Fiber Optic Model	4 pcs
POG 462	Diaphragm, 3 and 5 slits	2 pcs	POG 110	Plane Mirror	1 pc
POG 260 02	Lens Model, Plano-Concave	2 pcs	POG 099 01	Plane Mirror for color mixing	1 pc
POG 240 02	Lens Model, Plano-Convex	1 pc	POG 101	Flexible mirror	1 pc
POG 251	Lens Model, Semi Circular	2 pcs	POG 355 01	Object for shadowing, Hemisphere	1 pc
POG 310 03	Prism Model, Right Angle	1 pc	POG 355 02	Object for shadowing, Cylinder	1 pc
POG 311	Prism Model, Trapezoid	1 pc	POG 480 02	Arrow, 80 mm	1 pc
POG 312	Prism Model, Equilateral	1 pc	POG 480 01	Arrow, 40 mm	1 pc

code	Component	Qty
POG 465	Ray Box with Magnet	1 set
POG 461	Diaphragm, 1 and 2 slits	2 pcs
POG 462	Diaphragm, 3 and 5 slits	2 pcs
POG 260 02	Lens Model, Plano-Concave	1 pc
POG 240 02	Lens Model, Plano-Convex	2 pcs
POG 251	Lens Model, Semi Circular	1 pc
POG 310 03	Prism Model, Right Angle	1 pc
POG 311	Prism Model, Trapezoid	1 pc
POG 312	Prism Model, Equilateral	1 pc
POG 240 03	Lens Model, C-Shaped	1 pc
POG 245	Fiber Optic Model	1 pc
POG 110	Plane Mirror	1 pc
POG 099 01	Plane Mirror for color mixing	3 pcs
POG 101	Flexible mirror	1 pc
POG 355 01	Object for shadowing, Hemisphere	1 pc
POG 355 02	Object for shadowing, Cylinder	1 pc
POG 480 0 02	Arrow, 80 mm	2 pcs
POG 480	Arrow, 40 mm	2 pcs
POF 215 01	Color filter disc, Subtractive (CMY)	1 set
POF 210	Color Filter, RGB	1 pc
POF 220 01	Color filter, Red	2 pcs
POF 220 02	Color filter, Blue	2 pcs
POG 400 03	Optical Disc with Degree Scale, Magnetic	1 pc
POG 490	Projection Wedge	1 pc
POG 351	Cuvette with magnet	1 pc
GSN 245	TPS Frame, 1200 mm	1 pc
GSN 246	Adhesive Magnetic Board	1 pc

Experiment Topics

Diffusion of Light

P 31 01 Propagation of Light
P 31 02 Shadow
P 31 03 Lunar Eclipse (Model)
P 31 04 Solar Eclipse (Model)

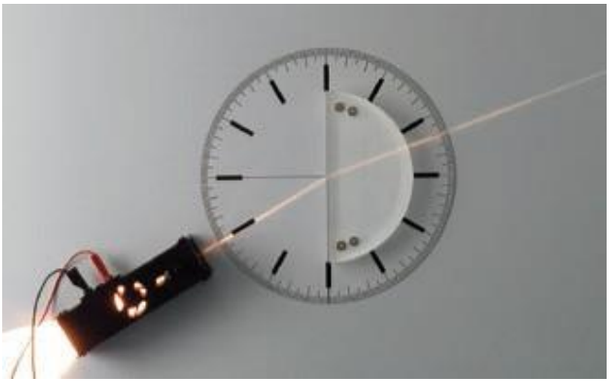
Reflection

P 32 01 The Law of Reflection
P 32 02 Rotating Mirror Regular
P 32 03 Reflection Diffuse
P 32 04 Reflection
P 32 05 Image Point on a Plane Mirror
P 32 06 Virtual Image on a Smooth Mirror
P 32 07 Concave Mirror

Supporting Tools

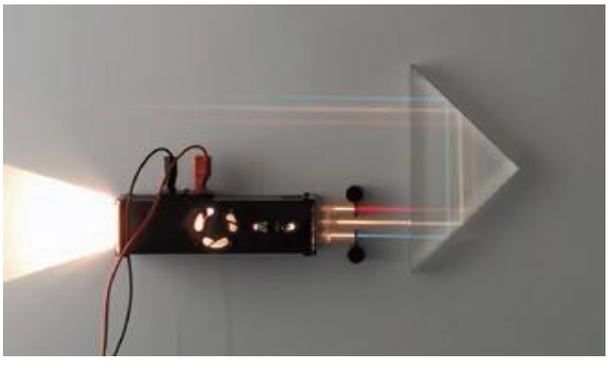
For detailed information, please refer to page 70 - 73.

Cat. code	Tool	Qty
ESP60751	Power Supply 5 A, 12 V	1 pc
ESP57916	Cocnnecting Lead, 100 cm, Black	2 pcs
ESP57917	Connecting Lead, 100 cm, Red	2 pcs



P 33 01 Refraction of Light

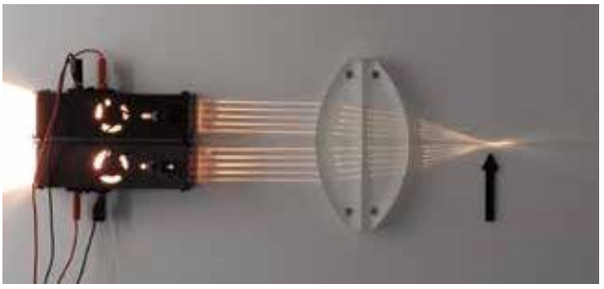
P 33 06 Basic Principle of a Photoconductor



P 33 11 Inverting Prism

Lenses

P 34 01 Refraction at Convex Lens
P 34 02 Refraction at Concave Lens
P 34 03 Position of The Focal Point of a Biconvex Lens
P 34 04 Position of The Focal Point of a Thin Planoconvex Lens
P 34 05 Position of The Focal Point of a Thick Planoconvex Lens
P 34 06 Refractive Effect of Convergent and Divergent Lenses on Diverging
P 34 07 Lens Systems
P 34 08 Special Rays on a Convergent Lens Special
P 34 09 Ray Paths on a Plano-Convex Lens Special
P 34 10 Ray Paths on a Concave Lens
P 34 11 Path of Rays When FormiNg an Image on a Convergent Lens
P 34 12 Path of Rays When Forming an Image on a Divergent Lens



P 34 05 Position of The Focal Point of a Thick Planoconvex Lens

The Eye

P 35 01 Ocular Accommodation
P 35 02 Faulty Vision and Its Correction - Near-Sightedness
P 35 03 Faulty Vision and Its Correction - Far-Sightedness

Optical Instruments

P 36 01 Path of Rays in a Single Lens Reflex
P 36 02 Camera Path of Rays in a Slide Projector
P 36 03 Model of a Microscope
P 36 04 Model of an Astronomical Telescope
P 36 05 Model of a Galilean Telescope

Color

P 38 01 Dispersion of Color
P 38 02 Spectral Colors Cannot Be Further Dispersed
P 38 03 Converging Spectral Colors To Make White
P 38 04 Mixed Color of a Partial Spectrum
P 38 05 Complementary Colors - Color Theory
P 38 06 Subtractive Mixing Colors
P 38 07 Additive Mixing Colors

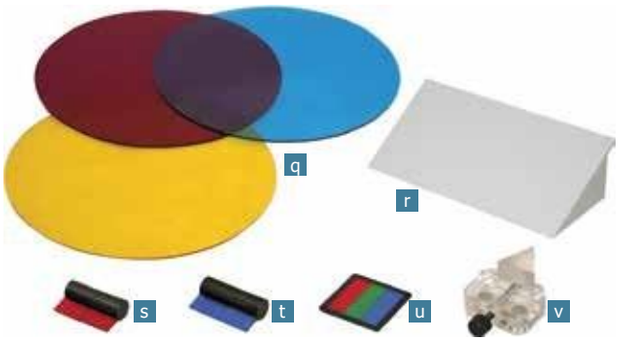
P 38 06 Subtractive Mixing Colors

P 38 07 Additive Mixing Colors

Component Details

Panel Board

a. Adhesive magnetic board (GSN 246), white laminated metal panel, dimension of 900 × 600 mm.
b. TPS frame system 1200 mm (GSN 245), aluminum extrusion frame with powder coating paint steel foot.



Light Source, Magnetic

Consisting of 2 light sources.

a. Raybox with xenon lamp 6 volt, 20 watt; aluminum box completed with cooling fan (POG 465).
b. Diaphragm, 3 and 5 slits (POG 462).
c. Diaphragm, 1 and 2 slits (POG 461).

Lenses and Prism, Magnetic

Made of shaped and polished acrylic; dimension is large with 20 mm thickness and 200 mm long.

d. Plan concave lens model (POG 260 02).
e. Plan convex lens model (POG 240 02).
f. Half circular lens (POG 251).
g. Square prism (POG 310 03).
h. Trapezoid prism (POG 311).
i. C shape lens (POG 240 03), photo conductor model.

Mirror, Magnetic

j. Flexible mirror (POG 101): made of stainless steel, adjustable focus according to the shaped curvature.
k. Flat mirror (POG 110).
l. Flat mirror for color mixing (POG 099 01).

Pointer and Obstruction Object, Magnetic

m. Cylindrical object for moon model (POG 355 02).
n. Half ball object for earth model (POG 355 01).
o. Pointer arrow, 80 mm long (POG 480 02).
p. Pointer arrow, 40 mm long (POG 480 01).

Color Experiment Tools

q. Color filter disc; subtractive; CMY (POF 215 01); set of filter colored disc cyan, magenta and yellow.
r. Inclined plane screen, magnetic (POG 490).
s. Red color filter, magnetic (POF 220 01).
t. Blue color filter, magnetic (POF 220 02).
u. Additive color filter; RGB (POF 210); three colored slide for color mixing.
v. Equilateral triangle prism (POG 312); flint prism holder with lock bolt and magnetic mounting.

Accessories

w. Cuvette with magnet (ESP 351).
x. Optic fiber model (ESP 245).
y. Magnetic optic disc, with scales (ESP 400 03).

Optical Experiment Kit
ESP60400

- The Optical Experiment Kit is designed to perform a few basic optical experiment such as the measurement of lens' focal point, images that is generated by convex and concave lens and mirrors, and even the proof of concept of a telescope.
- This kit has been designed and manufactured with wit and precision so that the optical experiment that requires moving objects by means of sliding can be done seamlessly.

Component List Consisting of 23 components, packed in a plastic injection moulding box. Dimension: 62 × 30× 9 cm. Weight: 3.8 kg.

Cat. code	Component	Qty
POF 100	Precision Rail 100 cm	2 pcs
FPT 16.17/87	Rail Clamped Holder	5 pcs
FPT 16.04/68	Rail Footing	2 pcs
PT 16.03/67	Rail Connector	1 pc
FPT 16.06/76	Lamp Housing with Festoon Bulb	1 set
FPT 16.07/77	Diaphragm Slide Holder	1 pc
FPT 16.11/81	Candle Holder	1 pc
FPT 16.13/83	Convex Lens with Holder, f = +50 mm	1 pc
FPT 16.14/84	Convex Lens with Holder, f = +100 mm	1 pc
POG 200 02	Convex Lens with Holder, f = +150 mm	1 pc
FPT 16.16/86	Concave Lens with Holder, f = -100 mm	1 pc
POG 220 02	Concave Lens with Holder, f = -150 mm	1 pc

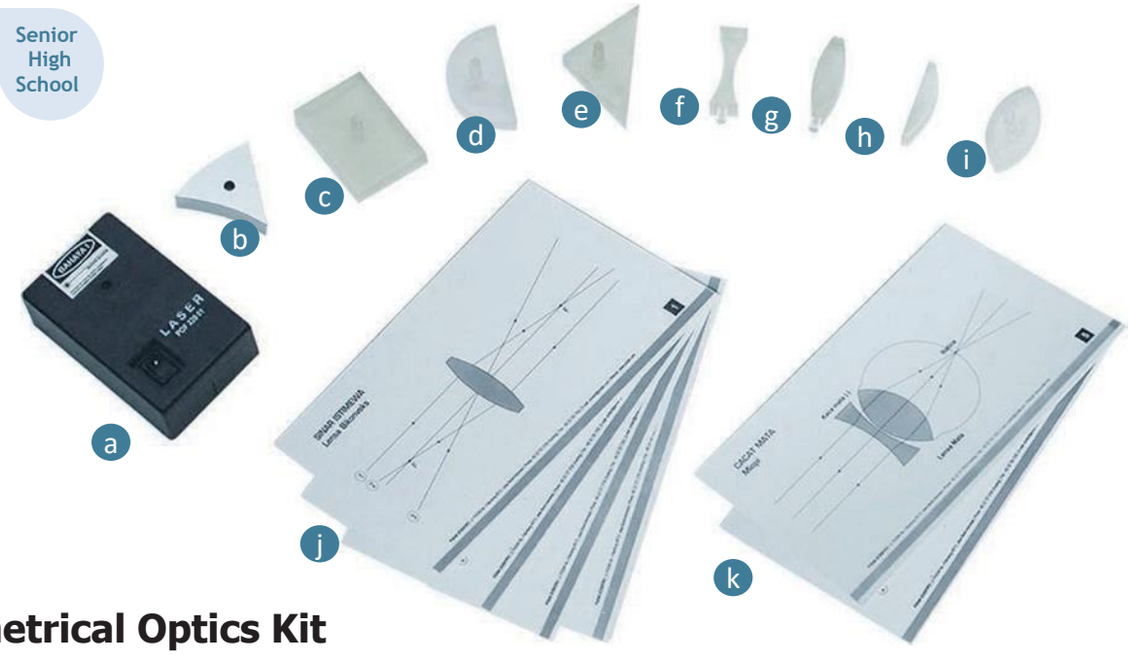
Cat. code	Component	Qty
POG 220 01	Concave Lens with Holder, f = -300 mm	1 pc
POG 120 04	Mirror Convex with Holder, f = -35 mm	1 pc
POG 120 01	Mirror Convex with Holder, f = -75 mm	1 pc
POG 120 02	Mirror Convex with Holder, f = -150 mm	1 pc
POG 100 04	Mirror Concave with Holder, f = 35 mm	1 pc
POG 100 01	Mirror Concave with Holder, f = +75 mm	1 pc
POG 100 02	Mirror Concave with Holder, f = 150 mm	1 pc
POG 550 07	Slide Model Signs	1 pc
FPT 16.25/95	Diaphragm Arrow	1 pc
FPT 16.12/52	Translucent Screen	1 pc
POG 700	White Screen	1 pc

Experiment Topics

E1 Convex Lens Focal Point
E2 Real Images Formed by Convex Lens (Object Distance, Image Distance, and Lens Focal Length)
E3 Virtual Images Formed by a Convex Lens
E4 Telescope
E5 Images Formed by Concave Lens
E6 Images Formed by Convex Mirror
E7 Images Formed by Concave Mirror

Junior High School

Senior High School



Geometrical Optics Kit

ESP60399

- Easy to use.
- Using a sharper and brighter laser beam.
- Optical objects are made of durable acrylic.
- Battery operated light source.
- Geometrical optics kit can be used to do simple observations and experiments concerning the geometrical optics. Light reflection and refraction can be observed easily, especially with the presence of the special light print out on a mirror or lens.
- Consisting of laser box with accessories and several transparent objects in several shapes (square, semi circular, prism, and lens models), and combination mirror.

Component List

	Cat. code	Component	Description	Qty
a	POF 320 01	Laser with 3 Beams	3 diode lasers produce sharp and bright parallel beams.	1 pc
b	FPT 16.23/93	Combination Mirror	Made of plastic, laminated with mirror material, side lenght 60 mm, height 15 mm.	1 pc
c	FPT 19.08	Rectangular Prism with Holder	Made of injected acrylic.	1 pc
d	FPT 19.12	Semi Circular Lens with Holder	Made of injected acrylic.	1 pc
e	FPT 19.13	Prism, Right Angle with Holder	Made of injected acrylic.	1 pc
f	FPT 19.10	Binconvex Lens with Holder	Made of injected acrylic.	1 pc
g	POG 240 01	Plan-Convex Lens with Holder	Made of injected acrylic, white painted at one side.	1 pc
H	FPT 19.09	Binconvex Lens, Thick with Holder	Made of injected acrylic.	1 pc
I	POK 200 01	Special Ray Template	Describing the course of three special rays on the mirror or lens.	1 pc
J	POK 200 02	Eye Defect Template	Describing the way of light at myopia and hipermetropi eye defects.	1 pc
K	POF 320 01	Laser with 3 Beams	3 diode lasers produce sharp and bright parallel beams.	1 pc

Experiment Topics

Reflection

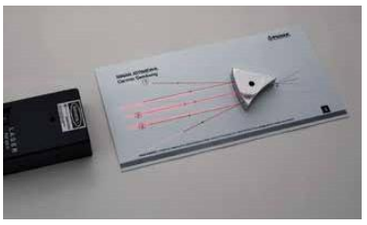
Experiment 2.1	Reflection of a Ray Image
Experiment 2.2	Reflection on Curved Mirror Reflection on a Concave Mirror Reflection on a Convex Mirror

Refraction

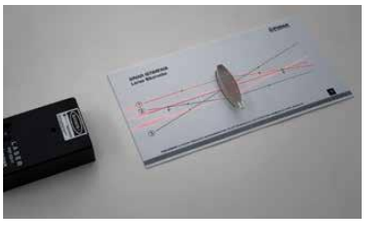
Experiment 3.1	Refraction and Law of Light Refraction Ray
Experiment 3.2	Index of Material
Experiment 3.3	Perfect Reflection 1
Experiment 3.4	Refraction by Alignment Surface Measuring of
Experiment 3.5	Ray Index Using Square Block Perfect
Experiment 3.6	Reflection 2
Experiment 3.7	Refraction by a Convex Lens 1
Experiment 3.8	Refraction by a Convex Lens 2
Experiment 3.9	Refraction by a Concave Lens

Eye Defects

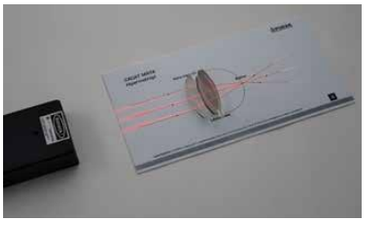
Experiment 4.1	Eye Defects - Myopia
Experiment 4.2	Eye Defects - Hypermetropia



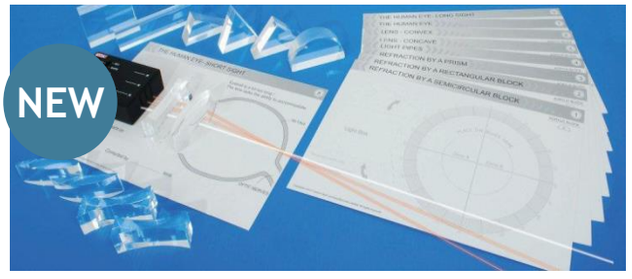
Experiment 2.2 Reflection on Curved Mirror



Experiment 3.7 Refraction by a Convex Lens 1



Experiment 4.2 Eye Defects - Hypermetropia



LED Light Box & Optical Set

Comprehensive light and optics set for the advanced study of light and optics, with experiments to show refraction and reflection through various shaped prisms and lenses, the splitting of light into the rainbow colours, how internal reflection is used in fibre optic cables and the appropriate lenses to use to correct long and short sightedness. Includes a 3-beam ray box (each beam available in dual colours – white or red), 12 crystal-clear acrylic lenses and prisms, teachers' notes and 9 pupil work cards.

ESP60406

Light Kit (Set Of 1)

Ideal for use by Primary School students aged 6 - 12 years. Designed for teaching the basic concepts of light. The student will be able to understand the characteristics of light and they can perform experiments with their own ideas. Manufactured with high quality standard. **Dimension:** 12.50 (L) x 8.00(W) x 4.50(H) cm **The kit contains:** 1pc x Right Angle Prism 90° 12x21.2x42.4mm 1pc x Mirror - 1pc x Light Box Complete

ESP60402

Light Box And Optical Set

A Robust light box in matt black finish with a 12 V 24 W axial filament lamp with flexible leads. One end of the box takes a cylindrical convex lens in an adjustable sliding mount to enable production of convergent, parallel or divergent beams. Complete with accessories which consist of: 5 Plastic blocks, one rectangular, one semicircular, one equilateral prism 60 x 60 x 60 , one right angle prism 90 x 60 x 30 and one right angle prism 90 x 45 x 45 . 3 Cylindrical acrylic lenses: one double convex, one double concave, both having the same radius of curvature and one thick convex lens. 3 Mirrors, one plane glass, one curved parabolic and one curved semi-circular. 2 Slit plates, one with three narrow and one narrow slits, the other with four narrow and one wide slits 1 Set of eight colour filters, Red, Green, Blue, Cyan, Violet, Yellow, Orange and Magenta. 1 Set of coloured cards, Red, Green, Blue, Violet, Orange, Cyan, Yellow and Pink. Complete with one spare lamp, in Styrofoam box.

ESP60405

Junior High School

Senior High School

Ray Box Kit

ESP60407

- Easy to use.
- Can perform 27 basic optic experiments.
- Optical objects are made of durable acrylic.

Ray box is a set of component which can be used to do simple observations and experiments concerning the basic characteristic of light, when it strikes a surface or propagates through transparent objects such as glass, water or plastic.

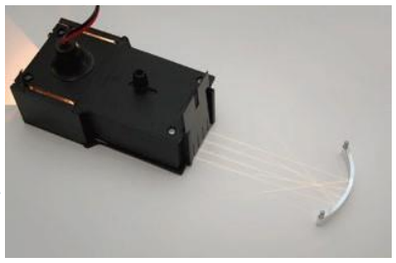
Component List Consisting of 14 items, packed in a corrugated plastic box. Dimension: 46 × 27 × 11 cm. Weight: 1.15 kg.

Cat. code	Component	Description	Qty
a ESP 19.01	Raybox	The front end of the box produces wide, narrow, parallel, convergent, divergent beams. The rear end of the box produces light source for color mixing.	1 pc
b FPT 19.07	Lamp Bulb SBC 12 V, 24 W	Light bulb, SBC 12V / 24W, with straight filament	1 pc
c FPT 19.02	Semi Circular Mirror with Holder	Made of plastic, laminated with mirror material, diameter 69 mm, height 13 mm, can be used as a concave or a convex mirror.	1 pc
d FPT 19.03	Parabolic Mirror with Mirror	Made of plastic, laminated with mirror material, diameter 120 mm, height 13 mm, can be used as a concave or a convex mirror.	1 pc
e POG 460 03	Diaphragm 1 and 3 Slits	Size 50 x 77 mm, it has 1 and 3 slits.	1 pc
f FPT 19.05	Wide Slit and 4 Slits Diaphragm	Size 50 x 77, it has wide slit and 4 slits.	1 pc
g POF 225	Colour Filter, RGB-CMY	Size 50 x 77, consisting of 5 colors, blue, red, green cyan and yellow.	1 set
H FPT 19.10	Biconvex Lens with Holder	Made of injected acrylic with holder.	1 pc
I FPT 19.09	Biconvex Lens, Thick with Holder	Made of injected acrylic with holder.	1 pc
J FPT 19.11	Biconcave Lens with Holder	Made of injected acrylic with holder.	1 pc
K FPT 19.13	Prism, Right Angle with Holder	Made of injected acrylic with holder.	1 pc
L FPT 19.14	Prism, Equilateral with Holder	Made of injected acrylic with holder.	1 pc
M FPT 19.12	Semi Circular Lens with Holder	Made of injected acrylic with holder.	1 pc
n FPT 19.08	Rectangular Prism with Holder	Made of injected acrylic with holder.	1 pc

Experiment Topics

Reflection

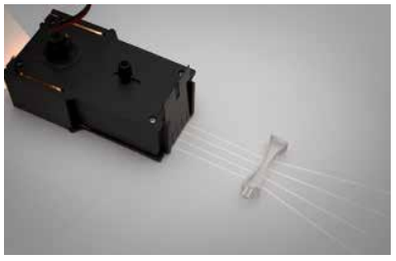
Experiment 2.1	Reflection of a Ray Image
Experiment 2.2	Reflection of Image Ray Convergent, Divergent, Parallel
Experiment 2.3	The Distance of Object and Shadow to the Flat Mirror
Experiment 2.4	Double Reflection
Experiment 2.5	Rotation Effect of Flat Mirror to the Ray Reflection
Experiment 2.6	Lateral and Vertical Inversion on Flat Mirror
Experiment 2.7	Reflection on Curved Mirror
Experiment 2.8	Reflection of Light by Curves Shaped Ball Mirror (Spherical)
Experiment 2.9	Spherical Aberration



Experiment 2.7
Reflection on Curved Mirror

Refraction

Experiment 3.1	Refraction and Law of Light Refraction
Experiment 3.2	Ray Index of Material
Experiment 3.3	Perfect Reflection 1
Experiment 3.4	Refraction by Alignment Surface
Experiment 3.5	Measuring of Ray Index Using Square Block
Experiment 3.6	Double Refraction by a Prism
Experiment 3.7	Minimum Deviation Angle
Experiment 3.8	Perfect Reflection 2
Experiment 3.9	Refraction on Two Prisms
Experiment 3.10	Refraction by a Convex Lens 1
Experiment 3.11	Refraction by a Convex Lens 2
Experiment 3.12	Refraction by a Concave Lens
Experiment 3.13	Dispersion of Light by Prisms
Experiment 3.14	Merging back the White Light Spectrum



Experiment 3.12
Refraction by a Concave Lens

Experiment 4.4
Color Addition

Color

Experiment 4.1	Opaque Object Colors
Experiment 4.2	Color It When Viewed Using Color Filters
Experiment 4.3	What Color Can Past the Color Filter?
Experiment 4.4	Color Addition

Ray Box

The front end of the box produce wide, narrow, parallel, convergent, divergent beams. The rear end of the box produce light source for colour mixing. **Overall Dimensions :** 17 x 9 x 9 cm **Material :** Plastic; This component is part of Ray box Kit. **Dimensions :** (L) 17.00 x (W) 9.00 x (H) 9.00 cm **Weight :** 0.280 kg

ESP60410

Ray Box With Magnetic Base

Ray box with magnetic base, variable focus. Designed to be placed on a metal support like table, board, bench. Equipped with 12V 21W bulb. Supplied with two slits.

ESP60409

Ray Box Raymond

An inexpensive ray box designed specifically for primary and lower secondary use. The raybox is housed in an ABS case with fixed slits - one single slit and one set of triple slits allowing two groups to work simultaneously. Raymond also has in-built primary colour filters which, with the use of two plane mirrors, allow the overlapping colour mixing discs to be projected. Operates on 6 V AC or DC Comes complete with two plane mirrors and a spare lamp.

ESP60408

Laser Ray Box Red Laser

The Battery Laser Ray Box has many advantages over a standard ray box. These include: Battery operated - technicians do not need to move power supplies from lab to lab No more broken (and expensive) ray box lamps No more burned fingers - the laser ray box runs cold No need to blackout the lab - just switch off the lights Class II laser - safe for class use ; Push switch operated (latching). Batteries last about a year and are easily replaced (2 x AAA) Pk of 10

ESP60413

Optics

Laser Optical Bench

Three carriers, one mirror, three brown observations, one prism fixture Two slit mirror holders, two concave / convex lenses One wrist and triangular prism, three film mounts (laser generator sold separately) ,Size 480*310*140mm 4.5Kg• Diffraction experiments with a single slit.

Experiment of diffraction interference by double slit.

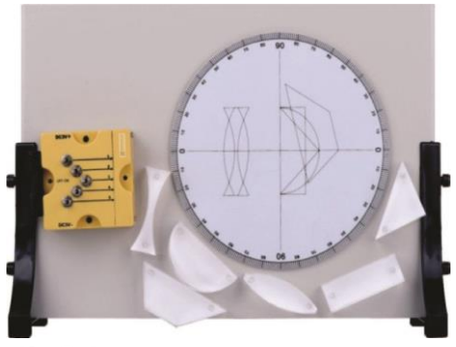
- Diffusion of light by convex and concave lenses.
- Refraction experiment by prism.
- Reflection of light by mirrors. 3 carriers, 1 mirror, 1 prism fixture Two slit mirror fixtures, two concave / convex lensesOne wrist and triangular prism, three film mounts 1 optical bench (laser generator optional selling).

ESP60415

Laser Source Single 02, Magnetic

Class 2 teaching laser for use as a high intensity light source especially for experiments in interference, diffraction and holography as well as interferometry; laser diode in magnetic module "compact"; wavelength: 635 nm; optical output power: ≤ 1 mW; for tripod mounting the holder for MBCs "compact“ power supply is required; operating voltage: 3 V (plug-in power supply unit included in delivery) housing dimensions: 84 x 84 x 39 mm

ESP60418



Laser Optic Set

1) Metal Board 40x28x2cm,with 2 Black side stands

2) 5 Line Laser Light Source, each line has a switch, operated with 2pcs of battery. The laser light source is attached with magnets. So it can be attached to the metal board.

3) White Graduated Turn Table, Diameter 21cm,printed with 4 quadrants and the angle.

4) Plexiglass Lens: Double Concave, Double Convex, Trapezoid, Right Angle Isosceles, Rectangle, Semicircle, total 6pcs.

ESP60414

Laser Source , Triple Beam

For experiments in geometric optics, for use on tables or magnetic on metallic boards in combination with optical model objects; a diode laser uses an in-built cylindrical lens to produce a long-range light beam, clearly visible on light coated metal panels even in daylight; by means of a prefixed beam splitter one, two or three laser beams can be set parallel or divergent; Technical data: diode laser, 635 nm (red) Pmax less Than 1 mW, class II ON/OFF switch

Operating voltage : 3 V (plug-in power supply included in the scope of delivery)

Dimensions: 84 x 84 x 39 mm (without beam splitter)

ESP60420

Transmitting Sound Via Laser Ki

kit consist of the following :

Laser 0.2/1.0 mW, linearly polarized, modulate, magnetic, Laser receiver unit, set Mains transformer 12V DC / 2A, Connecting cable for modulation, Round base with stand tube, uni, Holder for “compact” components, L-shaped assembly platform.

ESP60422

Laser Source 2 MW

- laser beam generation using He-Ne gas.
- A device that generates a laser beam for training purposes.
- Straightness, refraction, reflection experiment of light, diffraction interference experiment of monochromatic light. Type A: 2mW He-Ne Laser

ESP60417

Laser Source 0.5 MW

- It is a device that generates laser beam for educational purpose.
- Experiment of diffracted light of direct light, refraction, reflection experiment of monochromatic light Type B: 0.5 mW semiconductor laser

ESP60419

Doppler Ball

The buzzer is 92 dB while standing still, when spun a student can easily hear the shift in frequency
Buzzer housing has a simple on/off switch and is constructed of rugged ABS plastic
Nylon cord is 2'8" attached to a rugged ABS handle 8.5in long, 1in diameter)
Battery not included

ESP60421

Lamp Brightness Experiment

Students often think that the brightness of a lamp is only dependent on the current flowing through it. The unit allows the teacher to safely switch a 12V lamp in series with a mains lamp and study the current flow through them.
This includes kit includes the use of a safety mains lamp socket, which has a built in a switching system that only allows it to be switched on when a lamp is inserted. We have also included two switches, which must be pressed simultaneously to route the mains current through the low voltage lamp. Furthermore, the switches are sited at opposite ends of the case , requiring two hands to operate them. However, it must be appreciated that you are working with potentially lethal voltages and currents and therefore extra care should be taken.
Supplied with 1 x 240V 100W lamp and 1 x 12V 5W lamp and mains power lead.

ESP60427

Prism - Equilateral

Prism - equilateral, glass, polished faces, edges slightly bevelled, 60 x 60 x 60 degree.

ESP60437	25mm x 25mm (length x face)
ESP60438	38mm x 38mm (length x face)
ESP60439	50mm x 50mm (length x face)
ESP60440	38mm x 38mm (length x face)
ESP60441	50mm x 50mm (length x face)
ESP60446	60mm x 60mm (length x face)

Prism, Glass, Hollow

Prism, glass, hollow ,from glass plates properly cemented, with hole and stopper at top.

ESP60443	**Dimentions :** 38 X 38Mm (Hollow Prism Only)
ESP60444	**Dimentions :** 50 X 50Mm (Hollow Prism Only)
ESP60445	**Dimentions :** 50 X 50 X 50Mm (Cube Only)

Reflection Of Light Kit

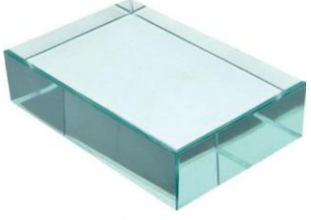
Have you ever looked at your reflection in a mirror and been confused which side of your body you were looking at? Have you wondered how a periscope works? Using this kit, students will study how light rays are reflected to give images back to our eyes. Rectilinear propagation of light, formation of images by plane mirrors, reflected image, virtual image, angle of incidence, and angle of reflection are all investigated using protractors, mirrors, diagramming, measurement, and construction of a simple periscope. Kit includes instructor's manual, student guides, assessment questions and all required materials. Appropriate for any level physics course (including AP) as well as general science courses. Designed for 12 students working in groups of two. Meets national standards for grades 9-12.

ESP60424

Blocks Set Of 7 Acrylic Blocks

Made of Polished Acrylic 15mm thick, the set is provided in a convenient storage box. Set consists of:
Rectangle 75 x 50mm Semi Circular 75mm dia.
Triangle 60 x 60 x 60 Degree, 58mm side
Triangle 90 x 45 x 45 Degree, 75mm hypotenuse
Triangle 90 x 60 x 30 Degree, 75mm hypotenuse
Bi-Convex 75mm long, curved faces 100mm radius Bi-Concave 75mm long, curved faces 100mm radius.

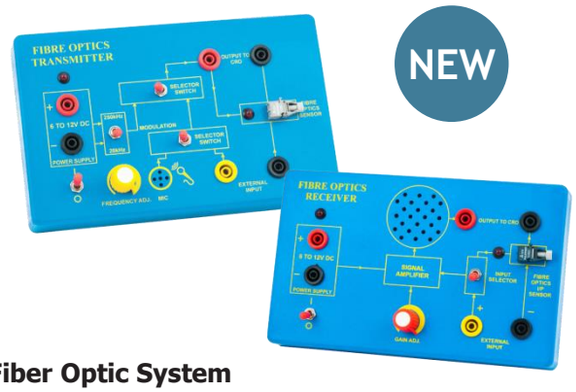
ESP60447



Glass Block, Rectangular

Block, rectangular, clear glass, free from air bubbles, all sides polished.

ESP60431	75 x 50 x 12mm	Block, rectangular, size 75 x 50 x 12mm. Clear glass, free from air bubbles, all sides polished.
ESP60432	75 x 50 x 18mm	Block, rectangular, size 75 x 50 x 18mm. Clear glass, free from air bubbles, all sides polished.
ESP60433	100 x 50 x 18mm	Block, rectangular, size 100 x 50 x 18mm. Clear glass, free from air bubbles, all sides polished.
ESP60434	100 x 60 x 18mm	Block, rectangular, size 100 x 60 x 18mm. Clear glass, free from air bubbles, all sides polished.
ESP60435	115 x 65 x 18mm	Block, rectangular, size 115 x 65 x 18mm. Clear glass, free from air bubbles, all sides polished.



NEW

Fiber Optic System

Set of one Transmitter and Receiver each housed in a small plastic case. The system comes complete with 5m and 10m sheathed polymer optical fiber coils terminated with clip housings to mate with the transmitter and receiver units

ESP60449

Spectrometer Precision

Vernier reading to 30 seconds of arc. The 175 mm diam. scale is fixed. The table and telescope movements are completely independent of each other and read to 30 seconds of arc by means of double ended verniers and magnifiers. Both rotations have fine adjustment screws. Coarse adjustments can also be made by release of clamping screw. Collimator is mounted on a fixed pillar and is fitted with 175 mm fl. Achromatic objective with 32 mm clear aperture and a laterally adjustable slit 6 mm long. Telescope is mounted on a movable pillar fitted with 175 mm fl. Achromatic objective of 32 mm clear aperture and x 10 Ramsden eye- piece with a glass cross line graticule. Both the telescope and collimator have rack and pinion focusing and can be adjusted for levelling the axes of both units as well as for adjusting to the axis of rotation. Prism table is marked with lines to assist prism placement and has three table levelling screws. It also has an interchangeable clamping unit for the prism and diffraction grating. Complete with prism clamp, diffraction grating holder and a Tommy bar for adjusting optical axis. In case.

ESP60450

Spectroscope Simple Hand Held

Plastic lens cone size 100 length x 25 mm Diameter , it can be used to demonstrate the phenomenon of the chromatic dispersion of white light by qualitative analysis

ESP60449

NEW

Spectrometer For Spectral Analysis

Spectrometer to effectively examine the visual part of the spectrum (from 360 nm to 940 nm). A high-quality transmission grating and the precise input slit guarantee good resolution and the resulting high accuracy of the results. Optical signal enters the device through the open area or flexible optic fiber. Data side is connected to the PC by USB 2.0 interface. It comes preconfigured and ready to use. The software is available in several languages and is compatible with Windows from XP. Scope of delivery: with USB cable, optical fiber (software and Instruction manual for download) Technical data: Spectral range: 360 - 940 nm, resolution: lees than 1.5 nm FWHM, pixel resolution: lees than0.5 nm, measurement frequency: up to 15 spectra per second (1280x1024).

Dimensions: 128 x 80 x 40 mm, weight: approx. 367 g

ESP60459

Light source for spectrometer

For analyzing spectra in combination with the spectrometer. Two light sources in housing, white halogen lamp and UV LED (365 nm). Cuvette holder for small solid materials and cuvettes for analyzing spectra of liquid samples. Scope of delivery:

1 x housing with 2 light sources (halogen and UV), 20 x cuvette, power supply unit: 9 V DC (100 ... 240 V AC).

Dimensions: approx. 70 x 80 x 55 mm, weight: approx. 256g

ESP60459AC

Spectroscope

.Quantitative spectroscope for measuring light, wavelengths, and colors from light sources , Holds diffraction grating and scale securely for legible readings Measures wavelengths from 400.0-700.0nm

ESP60448

NEW

Hollow Cells For Refraction Studies

For refraction, reflection and wave demonstrations. Dia. 200 mm

ESP60430

NEW

Semi Circular PERSPEX

Clear acrylic, all faces fully polished. Clear glass, all faces fully polished. Dia 100 x 18 mm thickness

ESP60428

Plan Mirror Circular - Ø 80 mm

Plan Mirror Circular - Ø 80 mm

ESP60495

NEW

Light Guide

An 'S' shaped acrylic bar 220 x 20 x 20 mm which can be used with the Ray box to demonstrate total internal reflection. It helps students to understand the principles of optical communications. The bottom of the bar is white to aid visibility.

ESP60429

Magic illusion

Diameter 24 cm

ESP60462

Optical Bench

1.5 Meter Complete With Accessories ;On wooden base, with 1.5 meter scale, with six sliding bases. Each sliding base is with an index mark, a pillar and locking screw, with following accessories: One lamp house with 230 V lamp. One object screen, metal, white. One lens holder for 38 mm diam. Lenses. One receiving screen, metal, white, with slot for squared paper on reverse. One object needle. One plane mirror in metal frame. Each of these accessories is mounted on a 6 mm rod which fits into the pillars and is adjustable for height.

ESP60465

Mirror Strip Holder

Wooden Cube with slot to hold mirror strip,

ESP60576

Mirror Plane Un Mounted -100 X 100MM PK/10

MIRROR, PLANE - UNMOUNTED -100 x 100mm. Rectangular, glass, back silvered, with protective coating, Pack of 10.

ESP60496

Lens Set (6Pcs)

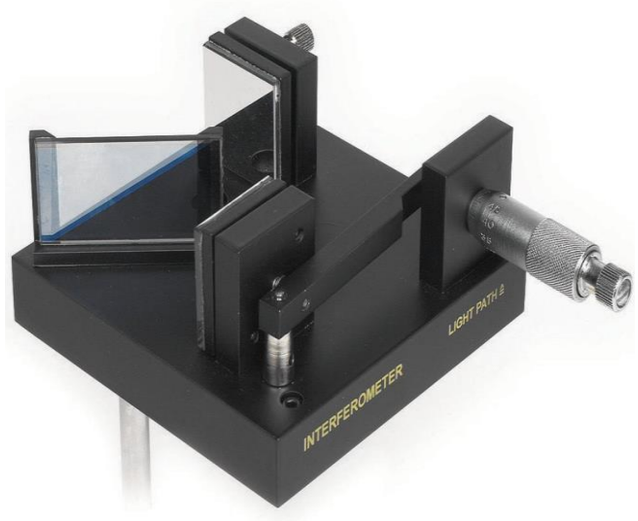
Set of 6 pcs lenses Diameter of 5 CM each , different Focal length :
FL : 200 MM 4 PC -FL : 150 MM 2 PCS

ESP60569

Interferometer

Very compact precision device for measuring e.g. wavelengths of light, refractive indexes of glass or gases; Base plate: stable metal plate, surface mirror with three adjusting screws, surface mirror adjustable by means of a worm gear (1:50 ratio) and micrometer screw (division 1/100 mm), semi-transparent mirror, lens +20 mm in side-sliding holder, lens - 30 mm in sideways relocatable holder, adjustment plate for NTL laser, thread and bore for mounting the swivel unit and the vacuum cell, 4 sturdy metal bolts at the corners serve as impact protection, Dimensions: 28.5 x 17 cm Working area: Made of foam for absorbing vibrations or other shocks Dimensions: 36.5 x 26.5 x 2.5 cm Screen, red: Metal bracket with red foil for colorful reproduction of the interference pattern, dimensions: 11 x 8 x 11 cm

ESP60455



Michelson interferometer

Precision device for measuring

phenomena such as light wavelength, index of refraction etc. Apparatus consists of a metal base plate (120 x 120 mm, 2 cm thick) with two full mirrors (30 x 30 mm each) and a half-silvered mirror (50 x 30 mm) mounted on it

according to the Michelson configuration.

The position of one of the full mirrors can be adjusted by means of a micrometer screw (micrometer 0 - 10 mm, vernier 1 / 100 mm) and a lever arm (step-down gear ratio of 1:10), while the other full mirror, which is fixed, can be inclined by means of two screws; the half-silvered mirror is fixed in place; the base plate has a hole for mounting round cell DL408- 3K in order to measure the index of refraction of gases. The underside of the base plate has a tapped hole taking a 10-mm threaded support for mounting the device on the optics bench; supplied with a solid plastic hood in order to protect all optical parts.

ESP60475

Required for Interferometer

Laser Single 02, Magnetic

Class 2 teaching laser for use as a high intensity light source especially for experiments in interference, diffraction and holography as well as interferometry; laser diode in magnetic module "compact"; wavelength: 635 nm; optical output power: ≤ 1 mW; for tripod mounting the holder for MBCs "compact " power supply is required; operating voltage: 3 V (plug-in power supply unit included in delivery) housing dimensions: 84 x 84 x 39 mm

ESP60418

Diffraction Grating

Diffraction grating,transmission type, 30 x 25 mm. With protective glass cover.

ESP60452	100 lines/mm
ESP60453	600 lines/mm
ESP60454	1000 lines/mm

Diffraction Grating Educational 3 In One Slide

For demonstrating the principle of the diffraction grating and the way in which its properties are dependent upon the number of lines per unit length. Comprises a card mount 90x40mm approximately with three 16x 9mm apertures, each containing a diffraction grating replica. The gratings are of 100lines/

mm. 300lines/ mm and 600lines/ mm, respectively and are protected by cover glasses.

ESP60456

Glass sheet 8"x4", 5mm thickness

Glass sheet Rectangular 200 x100 , 5mm thickness

ESP60587

Model of Astronomical Telescope

Complete with lenses fitted, mounted on metal base.

Complete with lenses fitted, mounted on metal base with diagram of rays shown for demonstration.

ESP60469

Mirror Universal

Universal Mirror - Stainless Steel - Length: 3.5 in - Height: 0.75 in One side flat and one side curved

ESP60494

Periscope

Diameter 30 mm Length of canister : 210 mm , total length 300 mm.

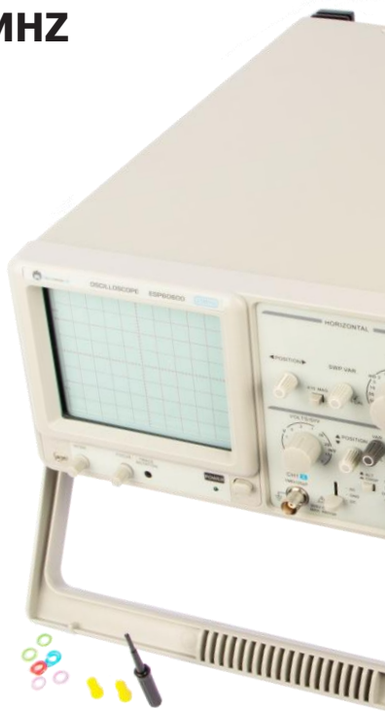
ESP60460

Oscilloscope Digital

dual-channel universal digital oscilloscope band width 50 MHZ It includes a 2 Mpts memory depth that helps to ensure accurate waveform resolution and to capture longer
signal lengths. With its 7 inch TFT-LCD (800*480) screen, there is adequate screen
space to help better see and analyze waveform Sampling Rate (Max.) 500 MSa/s 1
GSa/s
Channels 2+EXT
Memory Depth (Max.) 32 Kpts 2 Mpts
Trigger Types Edge, Pulse, Video, Slope, Alternate I/O USB Host, USB
Device, LAN, Pass/Fail
Probe (Std) 2 pcs passive probe, 2 pcs passive probe, 2 pcs passive probe, Display 7 inch TFT LCD (800×480)
Net Weight 2.5 Kg
details. Along with a 1 GSa/s sampling rate, It supports 32 parameters measurements and common mathematical operations to speed up complex / repetitive measurements.Multiple interfaces: USB Host, USB Device (USBTMC), LAN (VXI- 11), Pass / Fail

ESP60611	Band width -50 MHz	**ESP60613**	Band width -100 MHz
ESP60612	Band width -70 MHz	**ESP60614**	Band width -150 MHz

OSCILLOSCOPE ANALOG DUAL CHANNEL, 50MHZ



Model	ESP60600	ESP60601	ESP60602
vertical system			
Sensitivity	5mV~5V/DIV, 10 steps in 1-2-5 sequence		
Sensitivity accuracy	≤3%		
Vernier sensitivity	1/2.5 or less than panel indicated value		
Bandwidth	DC (AC 10Hz)~20MHz	DC (AC 10Hz)~40MHz	DC (AC 10Hz)~50MHz
AC coupling			
Rise time	Approx. 17.5ns	Approx. 8.75ns	Approx. 7ns
Input impedance	Approx. 1MΩ//Approx. 25pF		
DC balance shift	5mV~5V/DIV: ±0.5DIV		
Vertical mode	CH1, CH2, DUAL (ALT/CHOP), ADD, CH2 INV		
Chopping repetition frequency	Approx. 250kHz		
Input coupling	AC, GND, DC		
Max. Input voltage	400V peak-peak, AC frequency≤1kHz		
Common mode rejection ratio	>50:1 at 50kHz sine wave (set CH1 and CH2 at same sensitivity)		
CH2 INV BAL	Balanced point variation≤1DIV (referred to graticule center)		
Horizontal system			
Sweep time base	0.2us~0.5s/DIV, 20 steps in 1-2-5 sequence		
Sweep time base accuracy	±3%, X10MAG: ±5% (20ns~50ns/DIV uncalibrated)		
Vernier sweep timebase	≤1/2.5 of panel indicated value		
Sweep magnification	X10 (Max. sweep time base 20ns/DIV)		
Position shift caused by X10MAG	Within 2DIV at CRT screen center		
Linearity	±5%, X10MAG: ±10% (0.2s~1us)		

Trigger system			
Trigger mode	AUTO, NORM, TV-V, TV-H		
Trigger level lock	Not provided		
Trigger source	CH1, CH2, LINE, EXT		
Trigger coupling	AC: 20Hz to full bandwidth		
Polarity	"+" or "-" polarity		
Sensitivity	Frequency	20Hz~2MHz	2MHz~20MHz
	CH1, CH2	1DIV	1.5DIV
	ALT	2DIV	3DIV
	EXT	200mV	800mV
	TV: Sync pulse>1DIV (EXT: 1V)		
External trigger input	Input impedance: Approx. 1MΩ//Approx. 25pF		
	Max.input voltage: 400V (DC+AC peak), AC frequency≤1kHz		
X-Y mode			
Sensitivity	5mV~5V/DIV, ±3%		
X-axis bandwidth	DC~500kHz (-3dB)		
X-Y phase error	≤3° at DC~50kHz		
Output signal			
Calibration signal	Waveform	Positive-going square wave	
	Frequency	Approx. 1kHz	
	Duty ratio	<48:52	
	Output voltage	2Vpp±2%	
	Output impedance	Approx. 1kΩ	
CRT			
Display	6" rectangle, internal graticule, 8x10DIV (1DIV=1cm)		
Phosphor	P31		
Accelerating voltage	Approx. 2kV (20MHz); Approx. 12kV (40MHz)		
Trace rotation	Adjustable at front panel		
General			
Power source	AC110V/220V±10% selectable, 50/60Hz, Max.35VA		
Accessories	Power cord x1, Operation manual x1, Probe x2		
	Component test lead x1 (only for TOS-2020CT, TOS-2040CT, TOS-2050CT)		
Dimension	310x150x455mm		
Weight	Approx.8kg		
General			
Power source	AC110V/220V±10% selectable, 50/60Hz, Max.35VA		
Accessories	Power cord x1, Operation manual x1, Probe x2		
	Component test lead x1 (only for TOS-2020CT, TOS-2040CT, TOS-2050CT)		
Dimension	310x150x455mm		
Weight	Approx.8kg		

Mirror, Plane - Unmounted

Mirror, Plane - Unmounted - Rectangular, Glass, Back Silvered, With Protective Coating, Pack Of 10.

ESP60497	**Dimensions :** 75 x 25mm.
ESP60498	**Dimentions :** 75 x 50mm.
ESP60499	**Dimentions :** 75 x 75mm.
ESP60500	**Dimentions :** 100 x 25mm.
ESP60501	**Dimentions :** 100 x 50mm.
ESP60502	**Dimentions :** 100 x 75mm.
ESP60503	**Dimentions :** 150 x 25mm.
ESP60504	**Dimentions :** 150 x 50mm.

Lens Holder - Wooden

Wooden, with V shaped slot to take spherical lens or mirror up to 75mm dia., with index mark.

ESP60577

Concave Mirror, Spherical

Concave mirror, spherical - optically worked, back silvered, with protective coating.

ESP60505	FL 5 CM	Dia. 50mm
ESP60506	FL 7.5 CM	Dia. 50mm
ESP60507	FL 10 CM	Dia. 50mm
ESP60508	FL 15 CM	Dia. 50mm
ESP60509	FL 20 CM	Dia. 50mm
ESP60510	FL 30 CM	Dia. 50mm
ESP60511	FL 7.5 CM	Dia. 75mm
ESP60512	FL 10 CM	Dia. 75mm
ESP60513	FL 15 CM	Dia. 75mm
ESP60514	FL 20 CM	Dia. 75mm
ESP60515	FL 30 CM	Dia. 75mm
ESP60516	FL 10 CM	Dia. 100mm .
ESP60517	FL 15 CM	Dia. 100mm .
ESP60518	FL 15 CM	Dia. 150mm
ESP60519	FL 30 CM	Dia. 150mm

Convex Mirror, Spherical

Convex mirror, spherical - optically worked, back silvered, with protective coating.

ESP60520	FL 5 CM	Dia. 50mm
ESP60521	FL 7.5 CM	Dia. 50mm
ESP60522	FL 10 CM	Dia. 50mm
ESP60523	FL 15 CM	Dia. 50mm
ESP60524	FL 20 CM	Dia. 50mm
ESP60525	FL 30 CM	Dia. 50mm
ESP60526	FL 7.5 CM	Dia. 75mm
ESP60527	FL 10 CM	Dia. 75mm
ESP60528	FL 15 CM	Dia. 75mm
ESP60529	FL 20 CM	Dia. 75mm
ESP60530	FL 30 CM	Dia. 75mm
ESP60531	FL 10 CM	Dia. 100mm .
ESP60532	FL 15 CM	Dia. 100mm .
ESP60533	FL 15 CM	Dia. 150mm
ESP60534	FL 30 CM	Dia. 150mm

Biconvex Lens, Spherical,

Lens, double convex spherical,optically worked glass, with ground edges, highly polished.

ESP60535	FL 5CM	Dia. 38mm
ESP60536	FL 10CM	Dia. 38mm
ESP60537	FL 15CM	Dia. 38mm
ESP60538	FL 20CM	Dia. 38mm
ESP60539	FL 25CM	Dia. 38mm
ESP60540	FL 30CM	Dia. 38mm
ESP60541	FL 5CM	Dia. 50mm
ESP60542	FL 10CM	Dia. 50mm
ESP60543	FL 15CM	Dia. 50mm
ESP60544	FL 20CM	Dia. 50mm
ESP60545	FL 25CM	Dia. 50mm
ESP60546	FL 30CM	Dia. 50mm
ESP60547	FL 10CM	Dia. 75mm.
ESP60548	FL 15CM	Dia. 75mm.
ESP60549	FL 20CM	Dia. 75mm.
ESP60550	FL 25CM	Dia. 75mm.
ESP60551	FL 30CM	Dia. 75mm.

Biconcave Lens, Spherical,

Lens, double concave spherical,optically worked glass, with ground edges, highly polished.

ESP60552	FL 5CM	Dia. 38mm
ESP60553	FL 10CM	Dia. 38mm
ESP60554	FL 15CM	Dia. 38mm
ESP60555	FL 20CM	Dia. 38mm
ESP60556	FL 25CM	Dia. 38mm
ESP60557	FL 30CM	Dia. 38mm
ESP60558	FL 5CM	Dia. 50mm
ESP60559	FL 10CM	Dia. 50mm
ESP60560	FL 15CM	Dia. 50mm
ESP60561	FL 20CM	Dia. 50mm
ESP60562	FL 25CM	Dia. 50mm
ESP60563	FL 30CM	Dia. 50mm
ESP60564	FL 10CM	Dia. 75mm.
ESP60565	FL 15CM	Dia. 75mm.
ESP60566	FL 20CM	Dia. 75mm.
ESP60567	FL 25CM	Dia. 75mm.
ESP60568	FL 30CM	Dia. 75mm.

Magnifier, Linen Tester

These are collapsible pocket magnifiers. The optical system is a single element, glass Double Convex Lens. The housing is of machined, black high grade plastic for a high finish look. These magnifier fold flat to fit in your pocket. Scales are etched on the inner faces of the viewers base.

ESP60584

Magnifier, Reading Glass,

Magnifier, reading glass, in unbreakable plastic mount with handle.

ESP60580	Dia. 50Mm
ESP60581	Dia. 75Mm
ESP60582	Dia. 100Mm
ESP60583	Dia. 63Mm

Geiger Muller Counter

Demonstration instrument for measuring ionizing radiation; very easy to transport and magnetically mountable;
the 26-mm LED display allows precise readings to be taken even at a great distance

Technical Data:
Display: 4-digit LED display; digit height 26 mm Switch: ON / OFF
MODE switch:
- IMP setting: manual start and manual stop
- MAN setting: manual start, one measurement is taken during the interval set on the TIME switch
- AUTO setting: measurement cycle is repeated for the interval set on the TIME switch
TIME switch: for the MAN and AUTO modes a valid measurement interval of 1, 10 or 100 seconds may be selected
SPEAKER switch: switches the speaker on or off
START switch: starts and stops measurement in IMP mode and starts it in MAN mode
GATE LED: indicates counter gate state
Analogue output through a 3.5 mm phone jack (10 mV / Hz) BNC jack for connecting tube DR291-1Z
Power supply: 4 x 1.5 V Mignon cells (included) or 5.5-mm hollow DC jack for 6 V / 500 mA
external power supply
Case: green ABS plastic with yellow labelling
Dimensions : approx. 160 x 120 x 45 mm; **Weight :** approx. 475 g
Geiger-Muller tube specs: For registering the presence of alpha, beta and gamma rays;
tube in a red acrylic case (28 x 28 x 60 mm) and mounted on a support rod with a magnetic base (60 x 30 mm);
line marking centre; cord with BNC plug permanently attached;
plastic lid to protect the end window.
Gas filling: Ne & halogen
End window made of mica, 9.1 mm in diameter Plateau voltage: approx. 500 V
Dimensions : 30 x 60 x 49 mm
Axis height : 35 mm

ESP60663

Spark Counter

The Irwin Spark counter is a versatile unit designed to detect the presence of alpha particles or other ionising radiations or events, such as cosmic rays. The unit comes supplied with an Americium 241 alpha source (0.9 micro Curies, 33.3KBq) mounted on a Perspex rod, which may be held in the hand or in a retort stand, supplied with full instructions for use.
A power supply is needed to operate this unit.

ESP60664

Planck's Constant Led Threshold

A multi-purpose unit that allows the user to easily calculate Plank's constant, to measure the wavelength of coloured light, demonstrate colour light transmission through colour filters and show the diffraction patterns for various wavelengths of coloured light.

ESP60667

Radiation Dose Meter (Dosimeter)

For monitoring X-rays, beta and gamma rays, with alarm to protect people from radiation; TFT color screen for easy operation.
audible and visual alarms, alarm thresholds can be set;
Measures dose rates in real time and records total doses Calibration functior
Adjustable alarm thresholds
Display of the current total dose
Time-controlled measurement: 0 - 999
Alarm when limit values are exceeded
Saves the recordings of the last 10 measurements Display of the batter status
Warning in the event of sensor errors
Included in delivery:
carrying case, data cable, hand strap and manual Display: TFT 2.0 color scre
Sensor: GM counter tube
Detected rays: X-ray, beta and gamma
Range: 0.05 µSv ... 50 mSv
Accuracy: -17% ... + 25%
Alarm response time: <10 sec
Alarm modes: audible and visual alarm
Battery: 3.7 V / 1800 mAh
Battery life: 20 days (continuous measurement, sound off)
Weight: 127 g
Dimensions: 120 x 65 x 25 mm

NEW

ESP60665

NEW

Geiger Muller (GM) Tube and Holder

The GM Tube contained within this stand-alone holder is the industry standard type: ZP1481, as recommended in the Cleapss document GL:138 (Choosing a Geiger Muller Tube). The ZP1481 has a large area detection window making it suitable for all practical demonstrations and investigations as well as having an efficiency level suitable for detecting alpha, beta and gamma radiation, it is also robust and has a long life. The holder containing the GM Tube not only provides both protection and a choice of connections to the Tube but also the option to attach the holder to a retort stand using the supplied fixing rod. Also contained within the Holder is a high ohmic value (4M7) series resistor required by most Counter and Ratemeter (Scaler) units. If required the protection grill covering the detection window can be removed should you want to detect low levels of contamination. The standard connection provided by the GM Tube & Holder is via a flying lead fitted with a TNC plug connection suitable for connect to the IPC Timer Scaler & Frequency

ESP60666

NEW

Digital Timer Scaler & Frequency Meter

It is perfect for use with the GM Tube & Holder, it is exceptional value as a multifunction unit which can be used for a vast array of physics experiment

ESP60737

Po-210 Preparation (Alpha Radiation)

Radioactive substance for investigating the properties of alpha radiation Emits alpha radiation (polonium-210) with activity (A) = 3.7 kBq; half-life:138.40 days;emits alpha particles with a maximum energy level of 5.305 MeV

ESP60674

Co-60 Preparation (Gamma Radiation)

Radioactive substance for investigating the properties of gamma radiation; Emits gamma and beta radiation (cobalt-60) with activity (A) = 37 kBq; half-life: 5.258 years;in addition to beta radiation, which is absorbed by the radiation window, it emits gamma rays with an energy level of 1.17 and 1.33 MeV; this source is supplied with two lead-cylinders for protection of gamma radiation.

ESP60676

Photo Electric Effect Apparatus

A photoelectric device can be used to test the photoelectric effect, and a three-colour filter is built-in that can detect the light transmittance by the color filter.

Dimensions : 330x160x180mm Power: AC220V 0.5A

Configuration: Photoelectric element, Galvanometer, Incandescent light source, Tricolour filter, Photoelectric amplifier, Visible light band,

ESP60668

Planck's Constant Compact Apparatus

With this device, Plank's constant can be easily determined to an error level around or better than 5 %.

Electron affinity can be calculated as well. The phenomenon is termed the outer photoelectric. effect Electromagnetic radiation results in the release of electrons from a metal surface.

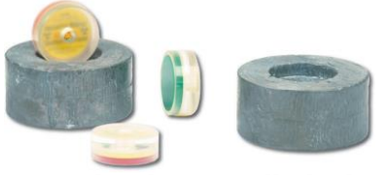
ESP60669

Storage - Case For Radioactive Sources, Metal

Steel cabinet for safe storage of radioactive preparations in the lab storage room Steel cabinet, painted yellow, with a cylinder lock,one (fixed) shelf,labelled with the warning symbol.

Dimensions : 215 x 85 x 287 mm

ESP60677



Sr-90 Preparation (Beta Radiation)

Radioactive substance for investigating the properties of beta radiation Emits beta radiation (strontium-90) with activity (A) = 3.7 kBq;nuclide decays to its daughter particle yttrium-90, which emits beta particles with a maximum energy level of 2.27 MeV; the half-life of Sr-90 is 28.9 years, and the Sr-90-Y-90 system also decays at this rate

ESP60675

NEW

Half Life Analogue Kit

Several topics in atomic physics lend themselves well to student-led exploration. This equipment facilitates hands-on engagement with the concept of 'half-life' and radioactive decay in a safe manner. It includes a tub containing 500 plastic cubes, representing atomic nuclei, each with one face marked for identification. Students actively participate by 'throwing' the cubes to observe how many 'decay' during each throw, i.e., land with their decay face upwards. After each throw, decayed nuclei are removed before the next round. This method yields highly accurate results resembling an exponential decay curve, all without the risks associated with using radioactive materials. The equipment comes with comprehensive instructions, worksheets, sample results, and spare materials

ESP60679

Millikan Apparatus Compact

Compact device for demonstrating the quantum nature of the electric charge q and for determining the elementary charge e.
All sensors and measuring devices are integrated - no additional external devices are required!
The compact experimental setup allows, on the one hand, to demonstrate the quantum nature of the electrical charge q
and also to determine the elementary electrical charge e. Basic device with attached experimental chamber. A plate capacitor with a central opening for the entry of the oil droplets ;that can be generated with the atomizer unit is integrated. The oil droplets are illuminated by green LEDs, the intensity of which can be continuously adjusted. ;To ensure clean work, the experimental chamber is protected by a cover.
The oil droplets are observed using a measuring microscope with a special eyepiece, which allows the oil droplets to be tracked across the entire field of view. ;It is operated via switches and rotary controls on the base device and on the display unit with touch screen.
All sensors and measuring devices necessary for the evaluation are already integrated -
no external measuring devices are required: voltage U, rise and fall times tS and tF as well as temperature T, pressure p and viscosity n are displayed on the screen for each measurement in real time. The measurements can be evaluated using either the float-sink method or the rise-sink method. The integrated time circuit starts and stops the respective time measurements automatically when the capacitor voltage is switched on and off.

Technical data:

Dimensions: 32 x 41 x 24 cm
Weight : approx. 4.2 kg (including power supply)

Scope of delivery:

1x basic device, including experiment chamber -
1x measuring microscope
1x oil atomizer - 50 ml oil for Millikan apparatus
1x plug-in power supply, 12 V (AC) / 0.5 A

ESP60701

Balmer Series and Rydberg Constant

Hydrogen atoms in a discharge lamp emit a series of lines in the visible part of the spectrum. This series is called the Balmer series which continues into the ultraviolet range. Rydberg generalized the Balmer's formula in terms of wave numbers to describe wavelengths of spectral lines of many chemical elements. For hydrogen the Balmer's formula becomes a special case of Rydberg's formula and is given by $1/\lambda=R(1/22 - 1/n2)$

where n are integers, 3, 4, 5, … up to infinity and R is Rydberg constant (R = 4/B where B is the Balmer's constant). In the present setup, the spectral lines of hydrogen is observed by means of diffraction grating. The wavelength of the visible lines of Balmer series of hydrogen are measured by spectrometry.

Specifications :

Scale : Brass, Dia. 175mm.
Objective: Achromatic lens, f = 178mm, Aperture 32mm
Slit: German silver with knurled screw
Reticle: 90O cross etched on glass
Least count: 20 seconds
Eyepiece: 15X, Ramsden eyepiece
Vernier : 4 Vernier's (Telescope & Prism table)
Base: 220mm dia., Aluminum Casting
Special features: Spindle & other critical component manufactured on CNC machine. Supplied in wooden box.

ESP60705

Cathode Ray Tube Mechanical Effect (With Fan)

For demonstrating of the mechanical effect of cathode ray tubes with 2 electrode and meta van , plastic bases

ESP60713

Alpha Scattering Apparatus

This Alpha Scattering Apparatus is for demonstrating Rutherford scattering by means of a gravitational

analogue of inverse square law repulsion. The apparatus comprises a spun aluminium hill, a 12.5mm steel ball and

a wooden launching ramp. The shape has been determined by varying its height above the base line by an amount Based upon the reciprocal of the radius.

The launching ramp has a guide groove

ESP60742

Cathode Ray Tube With Shadow Cross

For demonstrating the linear propagation of cathode rays, tube with electrodes mounted on metal caps, metal cross may be folded down, plastic base
Length: approx. 200 mm, diameter: approx. 80 mm

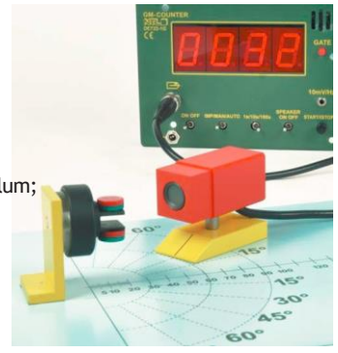
ESP60715

Cathode Ray Tube With Screen

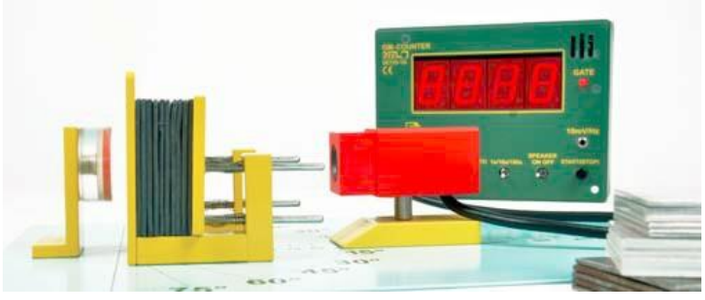
For demonstrating deflection of cathode rays in a magnetic field, electrodes mounted on metal caps, plastic base
Length: approx. 300 mm, diameter: approx. 50 mm

ESP60717

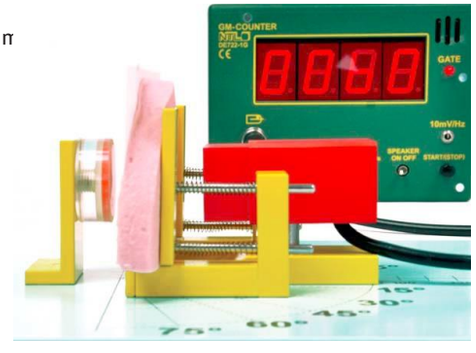
Radioactivity, Set



Box with device - shaped storage, consisting of:
1) Potassium chloride, 250 g
The naturally occurring substance is the primordial radionuclide 40K, which is available to 0.0117 atomic percent in the element potassium; specific activity of 16.2 Bq / g at 40K; 250 g in plastic box with screw cap
2) Columbit
Naturally occurring, slightly radioactive solid solution, also called Niobit, contains the elements niobium and tantalum; is NOT notifiable in accordance with the Radiation Protection Ordinance! **Dimensions :** L = 20 mm
3) Radiation absorption plates, set
Plates of various materials to the absorption of radiation;
materials: 10 x lead, 5 x steel, 5 x aluminum, 5 x acrylic;
plate **Dimensions :** each 80 x 50 x 2 mm
4) Holder for absorption panels, magnetic
For vertical mounting of up to 10 absorption panels, magnetic to metal panels or directly on the laboratory bench;
robust, variable clamping metal holder with 4 clamping springs, max. wingspan: 23 mm;
bottom side 4 built-in neodymium magnets; window opening : 50 x 50 mm;
Dimensions : width = 94 mm, height = 70 mm, depth = 54 mm
5) Radioactive preparation mount, magnetic
For vertical mounting of the radiation sources
aluminum bracket with magnets and steel bolt in axle height;
H (total) = 50 mm, axle height = 35 mm



6) Reagent tube, graduated
For tests for level measurement with a radiation source and lead shot;
thick-walled test tube with graduation, for clamping it into holder
content: 25 ml; D (outer) = 20 mm, H = 160 mm
7) Lead (tare) shot, 250 g
Lead shot used as absorption or as weights for taring;
ball D = 2 mm; in plastic bottle; capacity 250 g
8) Adapter for deflection in radioactive substances
To examine the behavior of radioactive radiation into a magnetic field;
metal holder for positioning the button magnets in front of sources
the holder is on the cover of preparations plugged directly; **Dimensions :** D = 35 mm, L = 28 mm



9) Magnets, button type, pair of
Material: Neodymium; embedded in plastic trays; D = 13 mm, H = 5 mm
10) Container with lid, 80 ml, plastics, 50 x 50 x 40 mm
Transparent, impact-resistant plastic container with lockable lid firmly
11) Knife for laboratory use, steel
To cut off meat or meat slices as a substitute for human soft tissue;
for determining the surface dose; handy stainless blade with plastic handle, L = 150 mm
12) Crucible tong
For low-contamination handling of radioactive sources
curved forceps made of steel and nickel-plated; L = 200 mm
Box-insert Radioactivity, plastics
Storage box II small, with cover

ESP60672

Deflection E/M Tube

For determining e/m by balanced electrostatic deflections or by magnetic deflection using the Helmholtz coils.

Simple electrostatic and magnetic deflection may be demonstrated and the relationships shown between the plate potentials or coil currents and the degree of deflection. The 'electron mirror' effect producing trochodial spirals is easily shown and also the magnetic focusing at points along the trochoid.

The tube is the standard glass sphere with cylindrical neck and has a diode electron gun with filament and cylindrical anode. In the centre of the sphere and angled at 15° across the axis is a mica screen 90mm long x 60mm high approximately, divided 2 to 10cm along its horizontal axis and 2-0-2cm vertically. The undivided side is coated with phosphor and produces a clear fluorescent trace when irradiated by the electron beam. The top and bottom edges of the mica plate are supported by horizontal metal plates which are connected to 4mm plugs in the side caps and provide the electrostatic deflection field when connected to an E.H.T. supply.

- Maximum filament voltage: 7.5V.
- Anode voltage: 1500 to 5000V.
- Typical operation: 2000 to 4500V.
- Anode current: 1mA.

Supplied complete with instructions.

ESP60680

Electron Diffraction Tube

The tube uses an electron gun with an indirectly heated cathode to project a narrow converging beam of electrons through a thin layer of graphiticised carbon, supported on a fine mesh grid over the exit aperture of the gun. The cathode rays are diffracted in passing through the carbon layer and produce a ring pattern on the phosphor coated end of the tube. Study of the ring pattern and its variation with different anode voltages permits the study and verification of the de Broglie hypothesis, shows the dual nature of the electron, permits the calculation of the spacing of diffracting planes and suggests the probable arrangement of carbon atoms.

- Filament voltage: Nominal 6.3V a.c./ d.c, Maximum 9V a.c./ d.c.
- Anode voltage: 500 to 5000V d.c.
- Anode current: 0.2 to 0.4mA.

Supplied complete with instructions.

The tube uses an electron gun with an indirectly heated cathode to project a narrow converging beam of electrons through a thin layer of graphiticised carbon, supported on a fine mesh grid over the exit aperture of the gun. The cathode rays are diffracted in passing through the carbon layer and produce a ring pattern on the phosphor coated end of the tube. Study of the ring pattern and its variation with different anode voltages permits the study and verification of the de Broglie hypothesis, shows the dual nature of the electron, permits the calculation of the spacing of diffracting planes and suggests the probable arrangement of carbon atoms.

- Filament voltage: Nominal 6.3V a.c./ d.c, Maximum 9V a.c./ d.c.
- Anode voltage: 500 to 5000V d.c.
- Anode current: 0.2 to 0.4mA.

Supplied complete with instructions.

ESP60686

Helmholtz Coil Pair

When connected to a suitable d.c. Supply, the coils provide a substantially uniform field in the central space. Each coil has a moulded plastic former 152mm diameter with 320 turns of 22 s.w.g. enamelled wire giving a mean diameter of 136mm. The former is mounted on a boss provided with two 4mm sockets and is fitted with a support rod. The rod has a sliding boss which locks into the tapered hole in the base of the Universal Stand. Dimensions of coil and support rod 305mm x 152mm x 25mm. Supplied as a pack of 2, complete with instructions. PAIR

ESP60682

Perrin Tube

The Perrin tube may be used to show that charge can be accumulated in the Faraday pail incorporated, that the charge does not disappear when the filament is switched off and therefore that the cathode rays must consist of charged particles. Electron deflection sensitivity may be measured using Helmholtz coils to deflect the beam.

Cathode ray tube operation may also be demonstrated, using a 'secondary coil' for the transverse field. The tube comprises a standard spherical glass body with a cylindrical neck containing a diode electron gun with filament and cylindrical anode, and a Faraday's pail in the sphere, at 45° to the axis. Connections to the diode electron gun are via 4mm sockets in the moulded cap and the Faraday's pail connection is via a 4mm plug in one of the side caps. The end of the sphere has an internal phosphor coating providing a luminescent screen.

- Maximum filament voltage: 7.5V.
- Anode voltage: 2000 to 5000V.
- Typical operation at 4000V: anode current 1.8mA beam current 4µA. Supplied complete with instructions.

ESP60688

Maltese Cross Tube

For showing the linear propagation of cathode rays, magnetic deflection of cathode rays, image distortion due to electrostatic charging, comparison of cathodic stream and electromagnetic radiation and an introduction to electron optics using a single Helmholtz coil. The tube comprises the standard spherical glass body with cylindrical neck, a diode electron gun with a filament and cylindrical anode connected to 4mm sockets in the plastic cap, a metal Maltese cross mounted in the centre of the sphere, (connected via a 4mm plug in one of the side caps) and a phosphor coated screen.

- Maximum filament voltage: 7.5V
- Anode voltage: 2000 to 5000V
- Anode current:4000V 1.8mA

Supplied complete with instructions.

ESP60684

Double Fine Beam Tube

Helium filled, partly evacuated electron tube with axial and perpendicular electron guns. The electron beam may be observed as a fine, green beam appearing due to the the impact excitation of the helium/electron collisions.The tangential beam can be deflected by use of Helmholtz coils to produce a completely circular path permitting e/m measurements to be made. Clear free path studies may be made and phenomena such as screen blanking due to charge build up on the screen may be observed. Within the tube are mounted two electron guns perpendicular to one another, with indirectly heated oxide cathodes. The angle of projection from the guns is adjustable by means of miniature deflection plates near the gun outlets, a small potential being applied via 4mm connections at the side of the cylindrical neck. The end of the body has a phosphor coated screen for use with the axial gun. Supplied complete with instructions.

- Anode voltage: max. 100V DC
- Anode current: max. 30mA
- Filament voltage: 7.5V AC/DC
- Deflector voltage: max. 50V DC
- Total length: 260mm approx.
- Glass bulb: 130mm diameter approx.
- Gas filling: Heliuim at 0.1 torr pressure

ESP60690

Heat Radiometer

Ball dia 90 mm , hight 215 mm

ESP60731

Experiment Lead Safety Plug And Socket

Safety lead for use with EHT and HT power supplies ending in a 4mm safety-plug. Length: 750mm , Wire cross-section: 1 mm² , Continuous current: max. 19 A

ESP60691

Planar Diode

The diode is used to show the basic thermionic effects in vacuum tubes, including:

Current flow between an incandescent filament and a cold electrode (the Edison effect). Determination of e/m by the displacement method using Helmholtz coils.

Characteristic anode current/anode voltage curves for different filament temperatures.

Application of a diode as a rectifier.

The diode consists of a basic glass spherical body with a cylindrical neck, containing a tungsten filament with 4mm connections sockets in the plastic cap on the neck and a circular anode plate connected to a 4mm plug connection on the sphere.

- Optimum anode voltage: 500V.
- Maximum anode current: 5mA.
- Maximum filament voltage: 7.5V

ESP60692

Universal Stand

Designed to accommodate the whole range of Teltron tubes and accessories. The base, 240mm x 180mm x 50mm, and a vertical arm of the stand, 280mm high, are cast in light alloy and stove enamelled. The three rubber feet ensure maximum stability.

Tube mounting jaws are provided, moulded in a material with very high electrical insulation properties. The jaws are split lengthways to admit the side caps of the tubes, and clamps sliding on the jaws lock them securely in position. The jaws, 160mm long x 140mm separation, have an integral hollow boss which is secured in the stand by a rubber 'O' ring at a centre height of 263mm, permitting a full 360° rotation so that the tube may be displayed to the best advantage.

Sockets in the base accomodate the Helmholtz coil supports and locate the coils accurately either side of the tubes.

A 4mm earthing socket is drilled into the pillar base. Supplied complete with instructions.

ESP60694

Tel - X - Ometer

The Tel-X-Ometer enables investigations to be carried out in the normal school laboratory. Extensive safety precautions are built into the apparatus, which conforms completely to the recommendations of the International Commission on Radiological Protection, 1968.

Schools should check CLEAPSS guide L93 Ionising Radiations and Radioactive Substances before purchase.

The radiation level at 50mm from any part of the surface of the instrument does not exceed 0.5mR per hour. Also, in accordance with the recommendations laid down, a warning card is supplied with each instrument for affixing to the door of the room where the experiments are to be conducted. The apparatus is in effect an X-ray spectrometer which, by means of simple adaptations, will fulfil a range of requirements as follows:

- A broad beam of X-rays for analysis of their general properties
- Single crystal Bragg Diffractometer having a scale accuracy of 5 minutes of arc
- Powder Camera for Debye/Scherrer experiments to an accuracy of 30 minutes of arc
- Fluorescent radiation emitter for a study of the Moseley Theory
- An experimental region for the mounting of innovative studies of the teachers choice.

Specification:

A specially designed miniature X-ray tube is used which protrudes through the cast aluminium base of the spectrometer table and is enclosed within a thick walled lead glass dome.

The apparatus is supplied with the X-ray tube installed and aligned for immediate use. Every instrument is carefully checked under working conditions before dispatch, in addition to thorough testing of the X-ray tube itself.

Mains power is supplied via 2m of 3-core cable and a sector enables the instrument to operate on voltages between 110 and 240, at 50 to 60Hz. A detailed instruction book is provided giving set-up details, notes for twenty-five experiments (using the accessory set) and teacher's notes.

Height 250mm, diameter 370mm. Mass 9kg. Supplied complete with X-ray tube.

ESP60698

Power Supply

- Electronic protection against over load or short circuit; automatic electric fuse with reset button and over load indicator LED.
- Screwed 4 mm socket terminals; main power switch with indicator lamp.
- Input voltage 100/220 volt equipped with main fuse.
- Dimension: 26.5 x 15.5 x 21.4 cm

Description	ESP60750	ESP60751
Max. power	3 A, 36 W	5 A, 60 W
Output AC/DC with voltage selector	0 - 3 - 6 - 9 - 12 V	0 - 2 - 4 - 6 - 8 - 10 - 12 V

Power Supply AC/DC, 50 Hz

Dimensions :

- Overall 265 x 155 x 214 mm - Input Voltage : 110/220 VAC, 50 HZ - Output voltage : 3/6/9/12 V
Materials entire frame (body) : Plastic Complete with manual book

Part of :

Physics Laboratory Package for Senior High School/Vocational School - Physics Laboratory Package for Senior High School/Vocational School - Ohm Law Experiment Kit

Dimensions : (L) 28.00 x (W) 18.00 x (H) 23.50 cm

Weight : 4.000 kg

ESP60749

Power Supply 2A, 5V & 15V, Regulated

Regulated variable power supply. Serves to provide / supply a stable voltage to the circuit or device must be operated with a certain power supply.

Dimensions :

- 297 x 114 mm, thickness 5 mm
- Back cover 267 x 113 x 100
mm Material : Panel phenolic
Line voltage : 220V AC / 50 Hz
Output voltage : Variable voltage 0-15 V DC and 0-5 V DC with panel meter display
Voltage control : Adjustable Fine and Coarse tuning Maximum current 2A
2 pairs of 4 mm output
Equipped with safety fuse

ESP60754

Power Supply 3A, 12V, Regulated

Dimensions : 234 x 170 x 134 mm
Low-voltage power supply with AC/DC output. Complete with automatic safety fuse.
DC Regulated
4 mm socket terminal, spacing 19 mm between terminals. Main switch equipped with indicator lamp.
Input voltage 100V/220V, with safety fuse and 2 cables and plug with grounding (DIN 49441/CEE7 10A).
Maximum load capacity : 3
A Power consumption : 36
W
Output voltage : 0 - 3 - 6 - 9 - 12V. Can be choose by the rotating switch. With bilingual manual book and circuit schematic diagram.
Dimensions : (L) 22.00 x (W) 26.00 x (H) 18.00 cm

ESP60752

Power Switch

A compact power supply offering 2, 4, 6, 8, 10, and 12 volts at currents of up to 5A. Both dc and ac outputs may be used simultaneously up to the rated output. The output is protected by a push button cut-out. The unit is 2A fused on the back panel and comes complete with a moulded mains lead and plug. 4 units are designed to fit in a shallow Gratnell tray. **Specification**
Input Supply voltage 230V
dc Supply frequency 50Hz
Mains fuse Rear panel 2A, 20mm quick blow Mains plug 3A
Output Voltage 2, 4, 6, 8, 10, 12V ac nominal 1, 3, 5, 7, 9, 11V full wave rectified dc nominal
Maximum output current 5A ac or
dc Manufactured in the UK

ESP60756 Single Unit
ESP60757 Best Value Pk Of 4 In Gratnells Tray

Powerbase V8 With V/I Meter Blue Case

Essentially the same as the Irwin Powerbase V8 but with an ammeter and VOLTMETER digital display. The unit supplies 0-20V smoothed dc and 0-16V AC at 8 amps. The output is continuously variable and protected by a panel mounted thermal cut out. An output limiter is fitted which allows the user to preset the maximum voltage available.

ESP60767

Powerbase V8

The updated version of the Irwin Powerbase 32. Essentially it is the same as the 32 but has a higher power rotary transformer and a high specification toroid transformer replaces the original chassis transformer. The unit supplies 0-20V smoothed dc and 0-16V AC at 8 amps. The output is continuously variable and protected by a panel mounted thermal cut out. An output limiter is fitted which allows the user to preset the

maximum voltage available.

ESP60760 Blue casing
ESP60761 Clear casing

Powerbase S8

The Irwin Powerbase S8 offers 0 to 12V at 8 amps via a relay switching system that provides the voltages in 1V steps. ac and dc are available simultaneously in any combination up to a combined output of 8 amps. Output is protected by a panel mounted thermal cut out. An output limiter is fitted which allows the user to preset the maximum voltage available. 0 to 12V AC/DC in 1V steps 8A combined simultaneous output Re-settable Thermal Trip Switch Protection Voltage Lockable via an Allen Key. Relay switching means that the output voltage may be changed at full loading.

ESP60764 Blue casing
ESP60765 Clear casing

Powerbase S5

Irwin Powerbase S5 switched 5A Bench PSU. A heavy duty power supply for powering laboratory experiments.
DC Output Voltages 3, 7, 10,13, 17, 20V (capacitor smoothed)
AC Output Voltages 3, 6, 8, 11,
13, 15V Output Current 5A
Output limited via Allen key operated voltage
lock Push button thermal cut-out protection
Mains Input 230/240V AC,
50Hz PDF

ESP60769 Blue casing
ESP60770 Clear casing

Powerbase S10

Irwin Powerbase S10 2-12V AC/DC switched 5A Bench PSU. A heavy duty power supply for powering laboratory experiments. DC and AC Output Voltages 2, 4, 6, 8, 10, 12V.

Specification:

AC DC Output: Voltages

2,4,6,8,10,12 voltage range in AC and DC

Current 5A

Supplied with Allen key to control output

Voltage type - Stepped

Output type - Full wave rectified, non-regulated

Push button trip reset

Mains input 230/240V AC, 50Hz

ESP60772	Blue casing
ESP60773	Clear casing

High Voltage Blue Case

The Irwin Powerbase HT unit supplies a constantly variable 0-300V d.c. at 60mA and a separate constantly, variable 0-30V d.c. Also at 60mA. In addition, it has a heater supply of 6.3V a.c at 2A to power up Teltron tube heater filaments. Both variable outputs are fully smoothed.

Useful for powering valves, Teltron diodes, Millikan's oil drop experiment etc.

All outputs are short circuit protected.

ESP60778

High Voltage Ej0127 2.5Kv Eht Unit

An EHT power unit supplying up to 5KV for experiments with Teltron tubes. The 5KV voltage allows the user to demonstrate high voltage experiments such as the shuttling ball. The outputs are arranged as 2.5KV 0 - 2.5KV The outputs are terminated through colour coded shrouded 4mm sockets. The EHT output is current limited to 2mA for safety. A separate heater output of approx. 6.3V @ 2A is also available as well as an earth terminal to allow any of the EHT outputs to be grounded for extra safety.

ESP60775	Blue casing
ESP60776	Clear casing

Electrosound Powerbase

The Electrosound Powerbase is our alternative to the popular Irwin Powerbase 32. This Powerbase is ideal for use in Physics, Biology and Chemistry experiments in secondary and sixth form schools. It has the same electrical specifications as the old Irwin model but comes with a sturdy, powder-coated steel case with fold flat carry handle making it easily stackable.

A very popular power supply that has proven to last the rigours of daily use within schools with its tough construction and tamper proof fixings. 0-15V a.c. and 0-20V smoothed d.c. at up to 8A, Combined Continuously variable output, Maximum voltage lock Push button reset

Short circuit protection, Designed and manufactured in the UK, 5 Year Warranty, Tough steel powder coated casing, Stackable

Supplied with power lead, Heavy-duty screw-in rubber feet

ESP60782	Single Unit
ESP60783	Best Value Pack 15

Power Supply Spider 1.5 3 4.5 6V 1A DC

The Spider power supply has been specifically designed for Primary, Middle and Lower Secondary school use. Offering 1.5, 3, 4.5 or 6V smoothed and regulated DC at up to 1A, it is the ideal next step from using cells and batteries.

Four sets of terminals mean it can be used by four groups simultaneously enabling children to connect a multitude of low voltage electrical devices with the spider's bright LED's act as power output monitors.

Manufactured in the UK

No batteries needed, 4 x 4mm output terminals, Compact and safe design

Fun to use

ESP60792

NEW

Power Supply AC / DC 0-12 V 5 Amp. Economy

A compact power supply, With Short circuit protection ,
Over load protection , Over temperature protection , Stable voltage Output :
Voltage DC : 2V, 4V, 6V, 8V, 10V, 12V
AC : 2V, 4V, 6V, 8V, 10V, 12V
Current DC : 0~5A
AC Max. : 5A
Voltage accuracy : ±0.3V
Line regulation : ≤0.3V
Voltage ripple : ≤0.3%rms
Protection Short circuit, Over load protection, Over temperature protection
Power source AC220V±10%, 50/60Hz±5%
Cooling method Natural air cooling
Operating environment -10℃~40℃, 20%RH ~85%RH
Accessories Power cord ×1, Operation manual
Dimension 200W×90H×195Dmm ,Weight 3kg

ESP60664

Power Supply Digital (0-24 V) AC& DC 0-5 A

Used for general purpose supply provides the voltages most commonly needed with plenty of current for almost any experiments , AC& DC voltage.
3 Digits LED display
Current limit protection for DC output
Short-circuit protection for AC output
Over temperature protection
MTBF（e） : ≥ 2000 hours
Voltage DC : 0~24V
Voltage AC : 3V, 6V, 9V, 12V, 15V, 18V, 21V, 24V
Current DC : 0~5A
Current AC : Max.5A
Protection DC Current limit, short circuit and over temperature protections :
AC Short circuit and over temperature protections
Power source AC220V±10%, 50/60Hz±5%
Cooling method Natural air cooling
Operating environment -10℃~40℃, 20%RH ~85%RH
Accessories Power cord ×1, Operation manual
Dimension 160W×175H×260Dmm
Weight 6.5k

ESP60839/5

Power Supply Digital (0-24 V) AC& DC 0-10 A

Used for general purpose supply provides the voltages most commonly needed with plenty of current for almost any experiments , AC& DC voltage.
3 Digits LED display
Current limit protection for DC output
Short-circuit protection for AC output
Over temperature protection
MTBF（e） : ≥ 2000 hours
Voltage DC : 0~24V
Voltage AC : 3V, 6V, 9V, 12V, 15V, 18V, 21V, 24V
Current DC : 0~10A
Current AC : Max.10A
Protection DC Current limit, short circuit and over temperature protections :
AC Short circuit and over temperature protections
Power source AC220V±10%, 50/60Hz±5%
Cooling method Natural air cooling
Operating environment -10℃~40℃, 20%RH ~85%RH
Accessories Power cord ×1, Operation manual
Dimension 160W×175H×260Dmm
Weight 6.5kg

ESP60839/10

Battery Eliminator DC 0-6 V , 1 A

A low cost alternative to dry cell batteries. Housed in a robust ABS plastic case (IPC-0577-P). Ideally suited as a replacement in applications where batteries are normally used. Smoothed and regulated DC is available over those ranges selected by rotary switch. Output is via 4mm red and black sockets. The DC output voltage available are 1.5, 3, 4.5 and 6VDC at a maximum current of 1A.

Electrical Supply: 220-240VAC, 50-60Hz

Dimensions: 150 x 100 x 80mm overall

Mass: 0.85kg

DC Output Voltage Range: 1.5, 3, 4.5 and 6VDC

Maximum DC Output Current: 1A

ESP60841

Power Supply Variable AC/DC, 0 - 24V , 6 A

Technical data:

Output voltage: 0 ... 24 V AC or DC, continuously adjustable, max. 6 A

Digital display: LED 7 segment display, three-digit, digit height: 26 mm;

large selector switch to display direct or alternating voltage;

Output voltages can be taken from 4 mm safety sockets;

LED - indicator to display the active output socket pair;

galvanic isolation from the network;

On/off switch on the back;

DC voltage ripple: < 1 Vrms at rated load

Fuses: 3 circuit breakers, 1 fuse for display, 1 fuse for the mains input

Plastic housing made of ABS with 2 handle shells;

Connection voltage: 230 V AC/50 ... 60 Hz (200 VA);

Dimensions: 260x217x150 mm, mass: approx. 6,860 g

ESP60840

Power supply unit Dual Regulated DC 0-15 V / 1 A

Designed for use with electronic modules, transistors, amplifiers etc. where the current required is not more than 1A, this power supply provides a smoothed and regulated DC output voltage with a ripple typically less than 50mV. Output up to 15VDC positive and negative (with respect to zero) in 5 stepped ranges: 5, 6, 9, 12 and 15VDC. The outputs are from three 4mm sockets: positive, zero and negative, colour coded red, blue and black respectively. The outputs are switched by means of a rotating knob. Overload and short circuit protection is built in. An illuminated on/off switch is mounted on the rear panel adjacent to a fused appliance inlet. Housed in a robust metal case with a durable powder coated finish.

Electrical Supply: 220-240VAC, 50-60Hz

Dimensions: 179 x 190 x 85mm overall

Mass: 2.3kg

DC Output Voltage Range: 5, 6, 9, 12 and 15VDC (both negative and positive)

Maximum DC Output Current: 1A

ESP60842

Power Supply AC/DC Varivolt 0-20V / 6 A

Continuously variable 0-20VAC and full-wave rectified DC at maximum 6A continuously or 8A for short periods . Resettable thermal cut-out. Outputs from two pairs of colour coded 4mm sockets. Output voltage is indicated by means of a calibrated scale. An illuminated on/off switch is mounted on the rear panel adjacent to a fused IEC mains inlet. Enclosed in a robust metal case with a durable powder coated finish.

Electrical Supply: 220-240VAC, 50-60Hz

Dimensions: 255 x 220 x 110mm overall

Mass: 4.75kg

AC Output Voltage Range: 0 to 20VAC

Maximum AC Output Current: 6A (8A short period of time)

DC Output Voltage Range: 0 to 20VDC

Maximum DC Output Current: 6A (8A short period of time

ESP60843

Power Lock

The Powerlock power supply has both a lockable AC and DC outputs ranges by a simple key making it impossible for students to change the voltage. The Powerlock offers 2,4,6,8,10 and 12 in both DC and AC. Outputs may also be used simultaneously up to the rated output required. For safety, the output is also protected by a simple push button cut-out. Each unit is supplied with 2 that can be used on all Powerlock units if needed. Supplied with 2 keys.

Output voltages AC DC, 2,4,6,8,10,12 voltage range in AC and DC, Current 5A, Voltage type - Stepped, Output type - Full wave rectified, non-regulated, Push button trip reset, Mains input 230/240V AC, 50Hz, Supplied with mains plug and lead, Manufactured in the UK.

ESP60786	Single Unit
ESP60787	Best Value Pk Of 4 In Gratnells Tray

Westminster

A very popular and compact Westminster power supply is ideal for school use with its tough steel case protected by a tough powder coated finish that will last years of use. The unit will deliver up to 16A AC or DC through its colour coded terminal posts. This power supply is very popular for use in electromagnet experiments.

AC DC Output: Voltages 1-2V, Current 16A, Voltage type - Fixed, Output type - Full wave rectified DC AC, Mains input 230/240V AC, 50Hz, Supplied with mains plug and lead, Manufactured in the UK.

ESP60789	Single unit
ESP60790	Best value pk of 4 in gratnells tray

ESP60801

ESP60802

Case Repair Kit

If you damage your case on one of our Irwin Power Supplies this can easily be repaired quite easily with our simple to install replacement cover kits available in a choice of 3 colour options.

The kit comprises of Original Irwin blue, gloss black or crystal clear case

Three "mushrooms", which fit on the back of the case and act as a cable tidy, New cable clamp and fitting instructions.

Strain relief bush If you have difficulties removing the old cable clamp and cable, a specially designed tool to make the job easier is also available.

PDF

ESP60801	Blue Case	**ESP60802**	Clear Case

Cable Clamp Tool

Specifically designed for aiding the removal of the cable gland on Irwin casing.

ESP60803

Power Supply Single Output Linear DC

Single Output Linear DC Power Supply

Features:

Constant voltage and constant current operations
Auto CV/CC switch
Coarse and Fine control for voltage and current
Over current protection (OCP) and Over temperature protection (OTP) Intelligent cooling fan

Constant voltage operation

Line regulation 0.01% 5mV
Load regulation 0.01% 5mV
Noise 10mVrms

Constant current operation

Line regulation 0.01% 5mA
Load regulation 0.01% 5mA
Noise 10mA rms

Display

VOLTMETER 3 digits LED display
Ammeter 3 digits LED display
Accuracy (1% reading 1 digit)
Protection: Over current protection, OCP limit is adjustable from 0 to rated current. Over temperature protection: when internal temperature reaches 100 ° 10 °, OTP is activated and the output will be shut down.
Operating environment : 0 ° ~40 °, 80%RH
Storage environment : -10 ° ~70 °, 70%RH
Power source : AC115V/230V 10% Selectable, 50/60Hz
Accessories : Power cord x1, Operation manual x1, Short circuit plate x1

Dimensions : 125Wx155Hx170D mm

ESP60805	Range : 0-15V 0-2A	Voltage display:0.00-9.99-10.0-16.0V, Current display: 000.-999.mA 1.00-2.10A, W: 2.6 KG
ESP60806	Range : 0-15V 0-3A	Voltage display:0.00-9.99-10.0-16.0V, Current display: 000.-999.mA 1.00-3.10A, W : 2.6 KG
ESP60807	Range : 0-30V 0-1A	Voltage display:0.00-9.99-10.0-32.0V, Current display: 000.-999.mA 1.00-3.10A, W : 2.6 KG

Power Supply Single Output Switching DC

Single Output Switching DC Power Supply

Features:

Adopts PWM pre-regulation and linear adjustment
Constant voltage and constant current operations
Auto CV/CC switch
Coarse and Fine control for voltage and current
Over current protection, Over voltage protection and Over temperature protection Intelligent cooling fan

Specifications :

Constant voltage operation, Line regulation 0.05% 1mV, Load regulation 0.1% 5mV, Ripple Noise 10mVrms, Constant current operation, Line regulation 0.05% 10mA, Load regulation 0.1% 10mA, Ripple Noise 20mArms

Display

VOLTMETER 3 digits LED display, Ammeter 3 digits LED display, Resolution 100mV/10mA, Accuracy (1% reading 1 digit)

Protection

Over current protection, OCP limit is adjustable from 0 to rated current. Over voltage protection
Over temperature protection: when internal temperature reaches 655, OTP is Activated and the output will be shut down.
Operating environment 0 ~40 , 80%RH
Storage environment -10 ~70 , 70%RH
Power source AC115V/230V 10% selectable,
50/60Hz Accessories Power cord x1, Operation manual x1

Dimensions : 125Wx160Hx260D mm

ESP60808	Range : 0-15V 0-5A	Voltage display: 0.00-9.99-10.0-16.0V, , Current display: 000.-999.mA 1.00-5.10A W : 2 KG
ESP60809	Range : 0-15V 0-10A	Voltage display: 0.00-9.99-10.0-16.0V, Current display: 000.-999.mA 1.00-10.1A W : 2 KG

Power Supply Multiple Output Linear DC

Multiple Output Linear DC Power Supply

Features:

Two independent adjustable outputs 0~30V/0~3A x2, 0~30V/0~5A x2, one fixed output 5V/3A x1, Constant voltage and constant current operations, auto CV and CC switch, Low ripple and noise, low temperature drift, Auto Series and Parallel tracking operations, Output ON/OFF control, High efficiency, high power density, Over load and reverse polarity protections, Dual- colour four digital panel meters

Specifications:

Constant voltage operation, Line regulation 0.01% 3mV, oad regulation 0.01% 3mV (I?3A); 0.02% 5mV (I>3A), Ripple Noise (5Hz~1MHz) 1mVrms (I3A); 2 I806Vrms (I>3A), Constant current operation, Line regulation 0.2% 3mA, Load regulation 0.2% 3mA (I?3A); 0.2% 5mA (I>3A), Ripple Noise 3mArms (I?3A); 6mArms (I>3A)

Tracking operation

Parallel Line regulation: 0.01% 3mV, Parallel Load regulation:0.01% 3mV (I3A); 0.02% 5mV (I>3A), Series Line regulation:0.01% 5mV, Series Load regulation:300mV, Series Tracking error: 0.5% 10mV of the master, no load (with load, add load regulation 300mV)

Auxiliary output (fixed), Output voltage 5V 0.25V, Output current 3A, Load regulation 25mV @110/220VAC rated input, Ripple noise (5Hz~1MHz) 2mVrm

Display

VOLTMETER 3 digits LED display, Ammeter 3 digits LED display, Resolution 100mV/10mA

Accuracy Real voltage and current output: (1% reading 2 digits); Preset voltage and current: (1% reading 8 digits)

Insulation

Between base and output terminal: 20M/500VDC, Between base and AC power cord: 300M/500VDC, Operating environment 0~40, 80%RH, Storage environment -10~70, 70%RH, Power source AC110V/220V10%, 50/60Hz, Accessories Power cord x1, Operation manual x1, Test lead x1

ESP60811	Range : 0~30V X2, 0~3A X2	Output watt: 195 watt, Output voltage: 0~30V x2, Output current: 0~3A x2, Fixed output: 5V/3A, Output On/Off: Yes, Tracking Operation: Yes, Dimension (WxHxD): 255x155x370mm, **Weight :** 8kg
ESP60812	Range : 0~30V X2, 0~5A X2	Output watt: 315 watt, Output voltage: 0~30V x2, Output current: 0~5A x2, Fixed output: 5V/3A, Output On/Off: Yes, Tracking Operation: Yes, Dimension (WxHxD): 255x155x370mm, **Weight :** 10kg
ESP60813	Range : 0~30V X2, 0~3A X2	Output watt: 195 watt, Output voltage: 0~30V x2, Output current: 0~3A x2, Fixed output: 5V/3A, Output On/Off: Yes, Tracking Operation: Yes, Dimension (WxHxD): 260x160x330mm, **Weight :** 7kg
ESP60814	Range : 0~30V X2, 0~5A X2	Output watt: 195 watt, Output voltage: 0~30V x2, Output current: 0~5A x2, Fixed output: 5V/3A, Output On/Off: Yes, Tracking Operation: Yes, Dimension (WxHxD): 260x160x330mm, **Weight :** 9kg
ESP60815	Range : 0~30V X2, 0~3A X2	