NEW

Suitable for unit 1 of BTEC National award: Engineering principles

Forces Kit

This kit includes a set of different plastic shapes which fit onto a essential base unit for experiments in centres of gravity of two-dimensional objects. It also includes pulleys, weights and a magnetic protractor for experiments in concurrent and non-concurrent coplanar forces and angles. The selection of pulleys and weights allows you to create force triangles, polygons and linked polygons. The guidance notes show how to analyse and predict forces using Bow's Notation and the parallelogram of forces. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Centre of gravity
- Force triangles
- Force Polygons and Bow's Notation
- Linked Polygons (non-current forces)

Ordering information	
Forces Kit	HP5005
Essential base unit	HP5000

Suitable for Unit 2 of BTEC Higher National: Engineering Science

Suitable for unit 62 of BTEC Higher National award: Strength of materials

NEW

Suitable for unit 1 of BTEC National award: Engineering principles

Suitable for unit 27 of BTEC National award: Mechanical principles in practice

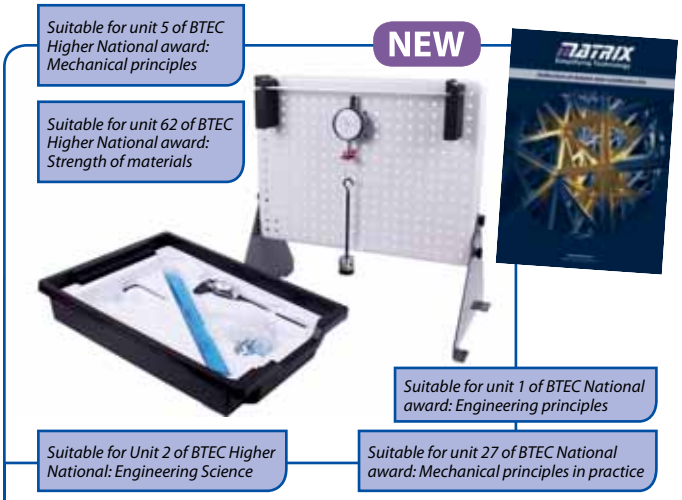
Moments Kit

This kit includes a rigid beam for experiments in the principle of moments, extending to levers and beams. It shows the three main lever types (1st, 2nd and 3rd order) and includes an 'L' shape plate for experiments in bell crank levers. A pulley allows extra experiments with moments caused by oblique forces. The rigid beam allows experiments that show the use of moments to find unknown weights, creating simple beam balances. It also works with spring balances to show reaction forces on beams with point loads and uniformly distributed loads (UDLs). Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Principle of moments
- Beam Balances
- 1st, 2nd and 3rd order levels
- Bell Crank Level
- Beam Reactions

Ordering information	
Moments Kit	HP5010
Essential base unit	HP5000



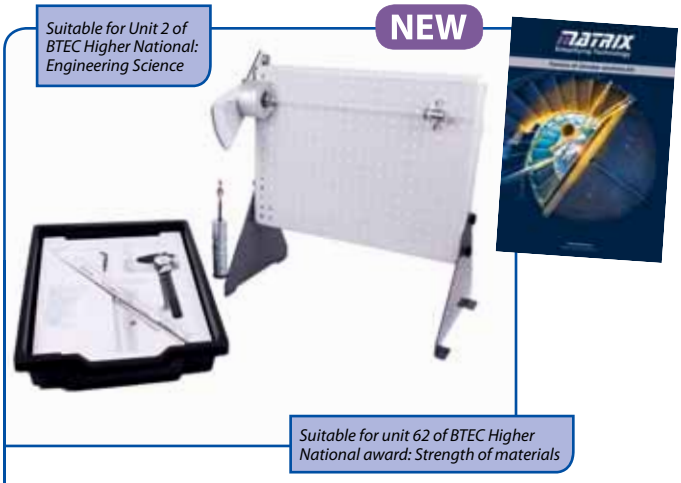
Deflection of Beams and Cantilevers Kit

This kit includes different beams and fixing blocks. The fixing blocks work as clamps or knife-edge supports. They hold the beams in different ways, such as a cantilever, simply supported, fixed (encastre) and a propped cantilever. Students set up a beam on the supports and add weights to deflect the beams. An accurate dial indicator measures the deflection at the point of loading. The choice of different beams allow extra experiments, showing the relationships between beam deflection and 'I' (second moment of area) value. They also allow comparisons of different beam material and how it affects deflection, introducing Young's Modulus. Students also use the cantilever for easy experiments showing the relationship between beam length and deflection. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Beam length and deflection
- Beam material and deflection (Young's Modulus)
- Beam 'I' value and deflection
- Beam supports (cantilever, propped cantilever, fixed beam and simply supported) and deflection

Ordering information	
Deflection of Beam and Cantilevers Kit	HP5015
Essential base unit	HP5000



Torsion of Circular Sections Kit

This kit includes different circular section specimens and adjustable chucks which fit on to a essential base unit for experiments in torsion. Students fix the specimens in the chucks and apply weights to a lever arm. The arm applies a moment (torque) to one end of the specimen. A scale on the arm shows the angle of twist. Standard tests show the relationship between torsion and 'J' (polar second moment of area) value. Students use this to predict the twist angle for any given specimen. The choice of different specimens allows comparisons of different specimen material and how it affects torsion, introducing the Modulus of Rigidity. Students also move the chuck positions for easy experiments showing the relationship between specimen length and angle of twist. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

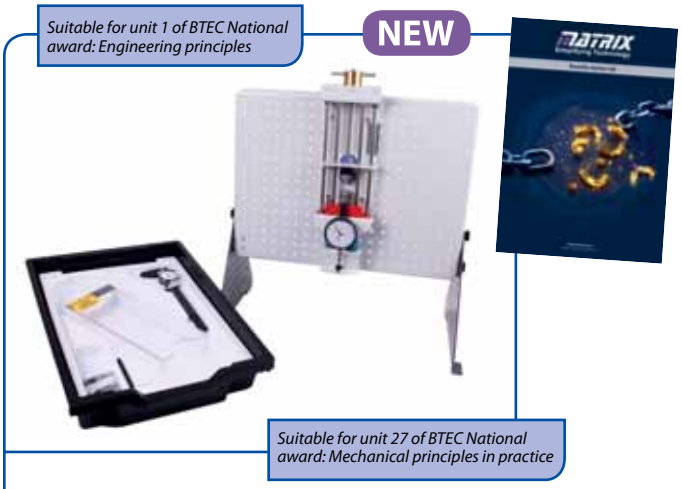
Learning objectives /experiments

- Specimen length and angle of twist
- Specimen material and angle of twist (Modulus of Rigidity)
- Specimen 'J' value and angle of twist

Ordering information	
Torsion of Circular Sections Kit	HP5020
Essential base unit	HP5000

Suitable for unit 1 of BTEC National award: Engineering principles

NEW



Suitable for unit 27 of BTEC National award: Mechanical principles in practice

Tensile Tester Kit

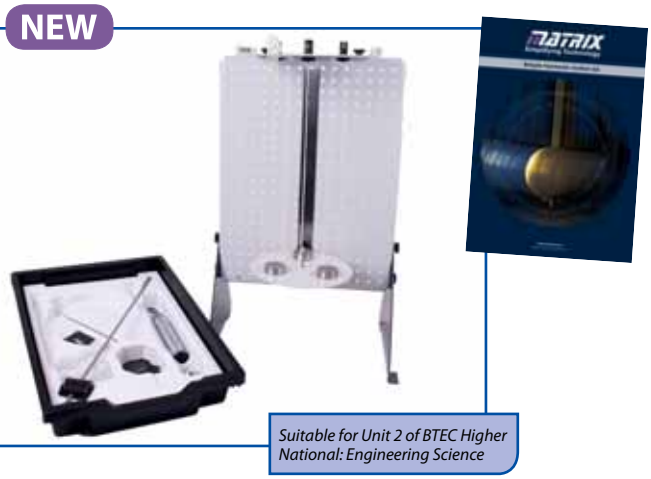
This kit includes specimens of different materials, which fit onto a essential base unit to show students the principles of tensile tests. Students use the tensile tester to stretch the specimens to destruction, while measuring the extension and force. The tests introduce students to tensile test terms including: overall stress and strain, yield properties, tensile strength and elongation. The choice of different specimens allows comparisons of different specimen material and how it affects its tensile properties. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Tensile tests (to destruction) of different materials
- Finding the tensile strength of a material
- Material behaviour in the elastic and plastic region
- Creating a force and extension chart

Ordering information	
Tensile Tester Kit	HP5025
Essential base unit	HP5000

NEW



Suitable for Unit 2 of BTEC Higher National: Engineering Science

Simple Harmonic Motion Kit

This kit includes different pendulums and a spring which fit onto a essential base unit to show students the principles and use of simple harmonic motion. Students test different pendulums and a spring to see how different factors, such as mass or pendulum length affect simple harmonic motion and the period of oscillation. The theory shows how to predict the period of oscillation for a given pendulum or spring for comparison with actual results. The kit includes an experiment with the Kater's pendulum that shows the relationship between simple harmonic motion and gravity, for prediction of gravity to a reasonable accuracy. The kit also introduces students to a simple 'spring rate' test, and key scientific terms such as moments of inertia and parallel axis theorem. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

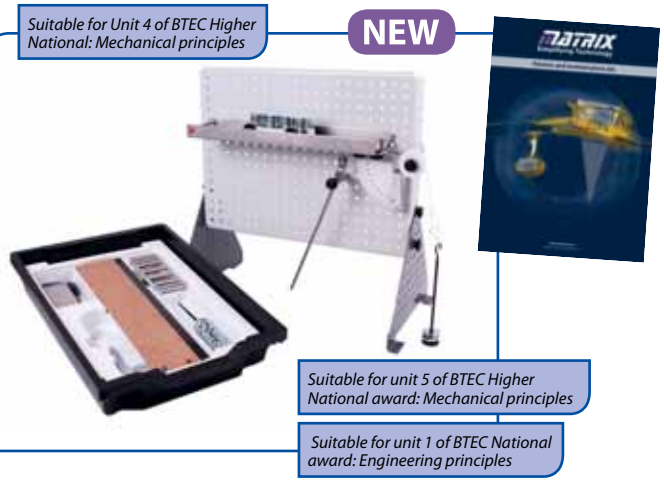
Learning objectives /experiments

- Simple harmonic motion of simple, bifilar and trifilar pendulums of different length and mass
- Simple harmonic motion of a spring with different masses, and a simple spring rate test
- Simple harmonic motion of a compound pendulum
- Simple harmonic motion and gravity using a Kater's pendulum

Ordering information	
Simple Harmonic Motion Kit	HP5030
Essential base unit	HP5000

Suitable for Unit 4 of BTEC Higher National: Mechanical principles

NEW



Suitable for unit 5 of BTEC Higher National award: Mechanical principles

Suitable for unit 1 of BTEC National award: Engineering principles

Friction and Inclined Plane Kit

This kit includes parts which fit on to a essential base unit to show experiments in friction and forces on a flat or inclined plane. The plane has an inclinometer and adjustment to allow the student to set the plane to any angle between zero and 90 degrees. The parts include different friction surfaces, a roller set, a rolling car or sled with adjustable mass and a simple roller. Students fit the different parts to the plane and apply masses. They learn how different surface finishes and mass affect friction and how surface angles and mass affect forces around a body on a plane. The experiments introduce students to important engineering and scientific terms, such as the coefficient of friction, sliding friction and kinetic friction. The inclinable plane allows students to do the classic 'forces on an inclined plane experiments'. It also shows the relationship between frictional forces and angles other than horizontal. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Forces on an inclined plane
- Rolling and Sliding Friction on different surfaces
- Kinetic and Static Sliding Friction between different surfaces
- Surface angle and friction between different surfaces

Ordering information	
Friction and Inclined Plane Kit	HP5035
Essential base unit	HP5000

Suitable for Unit 2 of BTEC Higher National: Engineering Science

NEW

Suitable for unit 5 of BTEC Higher National award: Mechanical principles

Suitable for unit 60 of BTEC Higher National award: Dynamics of machines

Potential and Kinetic Energy Kit

This kit includes a pendulum, a spring and a flywheel which fit onto a essential base unit for experiments in potential and kinetic energy. Students test each part to discover the difference between potential and kinetic energy and the transfer of energy from one form to another. The kit introduces students to key engineering terms such as 'moment of inertia' and 'elastic potential energy'. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Kinetic and potential energy in a pendulum
- Elastic potential energy in a spring
- Kinetic energy in a flywheel

Ordering information	
Potential and Kinetic Energy Kit	HP5040
Essential base unit	HP5000

NEW

Drive Systems Kit

This kit includes three different drive systems, which fit on to a essential base unit, to show their relative advantages and disadvantages. Students test a universal coupling, a belt drive and a chain drive to see how they work and how they differ in the way they transfer motion (power). The kit includes extra parts to help show the importance of the angle of lap around a pulley and its relationship with friction. The kit introduces students to key engineering terms such as gear ratio, pulley ratio and efficiency. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

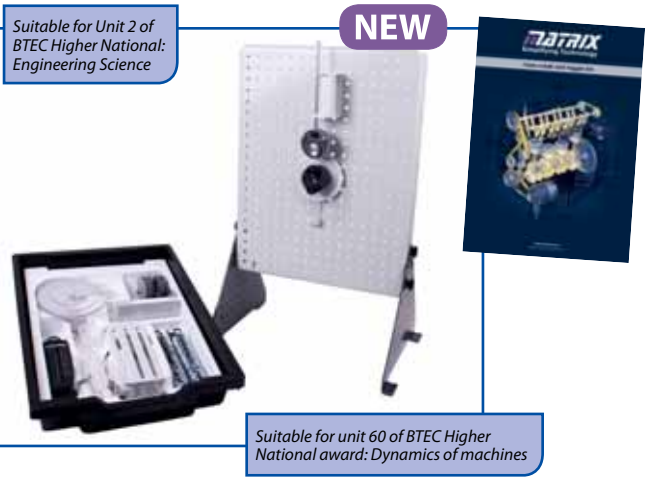
Learning objectives /experiments

- Power transfer, efficiency and direction in a belt drive
- Power transfer and efficiency in a chain drive
- Friction and angle of lap on a pulley

Ordering information	
Drive Systems Kit	HP5045
Essential base unit	HP5000

Suitable for Unit 2 of BTEC Higher National: Engineering Science

NEW



Suitable for unit 60 of BTEC Higher National award: Dynamics of machines

Cam Crank and Toggle Kit

This kit includes a crank and slider, which fit onto a essential base unit, to show the relative forces during crank motion. It also includes four popular cam shapes to show their different characteristics. Another set of parts in the kit shows the characteristics of a mechanical toggle. Students fit the crank and slider with weights and a spring balance to see the change in linear and rotational forces (moments) as the crank turns. They also use the slider with different followers on a set of four popular shape cams - heart, pear, spiral and round. This gives several cam and follower combinations to help students understand the different characteristics of each cam and why engineers choose between them for different applications. The last set of parts in the kit has a simple linkage that allows students to see the characteristics of a toggle mechanism. Its shows the relative forces and angular conditions of the toggle in its initial state and how they affect the point at which it locks or 'snaps' into a horizontal state. The kit introduces students to key engineering terms such as a 'flat follower', a 'roller follower' and 'toggle action'. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments with each kit are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Displacement and angle characteristics of pear, heart, round and spiral cams
- Characteristics of a mechanical toggle
- Turning moments and forces during crank motion

Ordering information	
Cam crank and Toggle Kit	HP5050
Essential base unit	HP5000

NEW

Suitable for unit 5 of BTEC Higher National award: Mechanical principles

Gear Trains Kit

This kit includes a selection of different gears which fit on to a essential base unit for experiments to find their unique characteristics. The gears include Spur Gears, a Bevel Gear and a Worm Drive. The spur gears have two sets of teeth on the same shaft, allowing extra experiments in compound gear trains. Students test each set of gears to see how it works and note the differences in characteristics (such as efficiency, gear ratio and mechanical advantage) of each set. The gear sets are a selection of the most common sets, similar to those used in real applications, such as automobile gear boxes, domestic and industrial hand tools and clockwork instruments. Each has advantages and disadvantages that make them suitable for a particular job. The kit introduces students to key engineering terms such as gear ratio, efficiency, mechanical advantage and velocity ratio. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Characteristics of Spur Gears, including single and compound gear trains and the 'idler' gear
- Characteristics of a Bevel Gear
- Characteristics of a Worm Drive

Ordering information	
Gear trains Kit	HP5055
Essential base unit	HP5000

NEW

Simple Mechanisms Kit

This kit includes three popular mechanisms which fit on to a essential base unit for experiments in conversion of motion from linear to rotary or rotary to linear. These include the Scotch Yoke (sometimes called 'donkey crosshead' or 'slotted link'), the Crank and Slider and the Quick Return mechanisms. Students test each mechanism to see how it works and note the differences in the way that each mechanism converts the motion. The three mechanisms are the same as those used in real applications, such as combustion engines, power assisted valves or fluid pumping systems. Each has a unique way of converting motion, shown by the experiments. The kit introduces students to key engineering terms such as reciprocating motion, rotary to linear motion and linear to rotary motion. Worksheets, guidance notes and lecturer notes (with answers) needed for typical experiments are supplied with the essential base unit. Essential base unit and kit must be ordered separately.

Learning objectives /experiments

- Conversion of motion using the 'Scotch Yoke' (or 'slotted link')
- Conversion of motion using the Quick Return mechanism
- Conversion of motion using the Crank and Slider

Ordering information	
Simple Mechanisms Kit	HP5060
Essential base unit	HP5000

Mechanical engineering

NEW

Suitable for unit 1 of the BTEC National in Engineering: Engineering principles

Suitable for unit 28 of the BTEC National in Engineering: Dynamic mechanical principles and practice

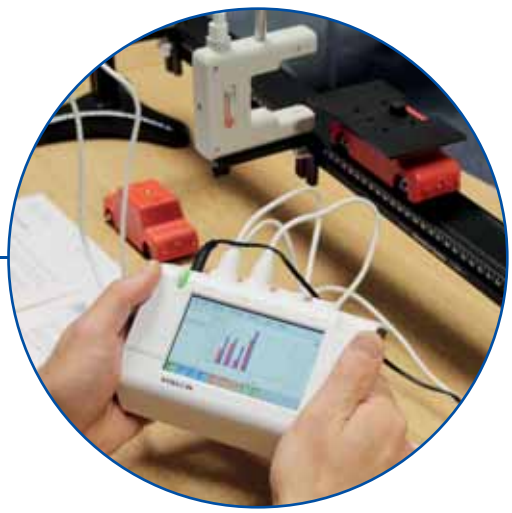
Suitable for unit 2 of the BTEC Higher National in Engineering: Engineering Science

Linear and rotational dynamics

This kit includes a dynamics track, handheld datalogger with LCD screen, and a range of sensors and accessories that allow students and teachers to carry out a range of experiments in dynamics. The datalogger can be used independently of a PC for many experiments with data automatically passed to Excel for further analysis. The datalogger has a VGA output which makes the equipment perfect for classroom demonstrations. The equipment is supplied with a suite of worksheets and teacher support material.

Learning objectives /experiments

- Parameters of Kinetics: displacement, velocity, acceleration
- Equations of motion
- Parameters of dynamics: inertia, acceleration, force, momentum, mechanical work and power
- Newton's laws of motion, conservation of momentum and energy
- Linear and angular motion
- Rotational dynamics
- Simple Harmonic motion



The datalogger included is fully self-contained and has a VGA output for connection to a projector for class demonstrations.

Ordering information	
Linear and rotational dynamics	HP5099

NEW

Suitable for BTEC National unit 6: Microcontrollers

Microcontrollers for Mechanical engineers

This solution provides a suite of microcontroller hardware as well as a kit of parts from which a number of mechanical models can be constructed using the Tetrix construction kit. The kit can be based on our Development centre for either PICmicro or Arduino microcontrollers supplied with additional servo board, motor control board and screw terminal interface board.

Learning objectives /experiments

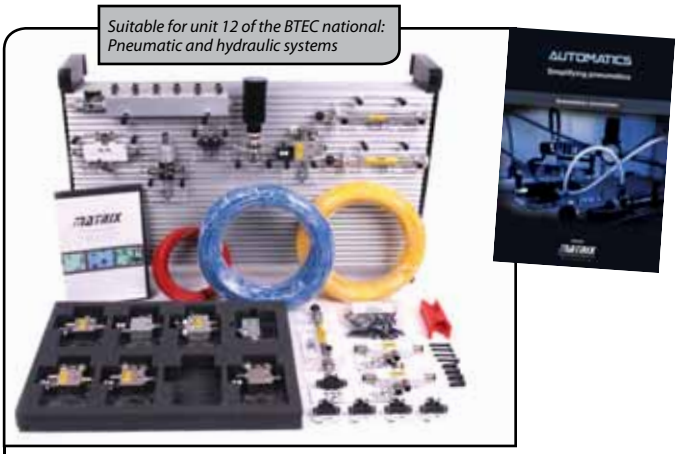
- Microcontroller programming and circuits, clocks, pins, inputs, outputs, ports, memory and memory types, current limits
- Programming using flowcharts, Arduino or MPLAB: input, system, output, loops, decision, subroutine, go to, calculations, delays, variables, strings, A/D conversion, interrupts, hardware macros, software macros, arrays
- Techniques: Binary, Hexadecimal, ASCII, calculations Components: clocking devices, switches, LEDs, LED arrays, sensors, LCD, 7-segment displays, quad 7-segment displays, power supply, EEPROM
- Techniques: switch de-bounce, Schmitt trigger, prototyping with E-blocks strip board

Arm made up from Tetrix.

For an explanation of icons please see page 6

Ordering information	QTY	
Tetrix prime starter set	1	HP2810
Either: Arduino development centre with printed base plate	1	HP9769
Or: PIC development centre with printed base plate	1	HP4988
E-blocks servo board	1	EB059
E-blocks motor control board	1	EB094
E-blocks screw terminal board	1	EB002
Power supply	1	HP2666
USB lead	1	HPUSB

Suitable for unit 12 of the BTEC national: Pneumatic and hydraulic systems



The Automatics essentials solution

This kit provides a complete introduction to pneumatic circuit design and construction. The curriculum pack includes a comprehensive set of worksheets that allow students to progress from first principles through to circuits of moderate complexity; including reciprocating circuits and generating sequences of movements.

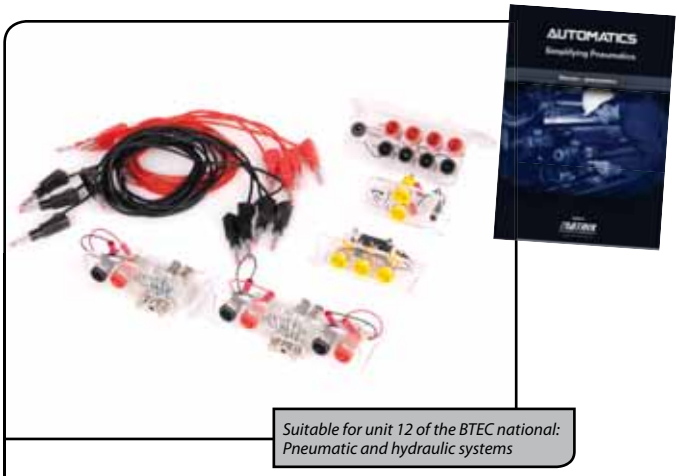
The solution is intended for students in their early teens and older who are learning technology and engineering subjects. Tasks are designed to be suitable for pairs of students sharing a single kit.
Everything you will need to teach the course is included in the solution pack, with the exception of an air compressor.

Learning objectives

- Understanding the different varieties of valves and where each is appropriate in a system
- Understanding the basic types of cylinder, controlling speed and the factors that influence power output
- Combining valves to produce logic functions
- Semi-automatic and automatic reciprocation
- Creating sequences of movements
- Using reservoirs to create time delays
- Air bleed and pilot operated circuits
- Component symbols and circuit diagrams
- Staying safe when using air at high pressure

Components included			
1	Cylinder, single acting	2	Cylinder, double acting
1	Valve, 3/2, button-spring	1	Valve, 3/2, lever-spring
4	Valve, 3/2, roller-spring	1	Valve, 3/2, diaphragm
1	Valve, 5/2, lever-spring	3	Valve, 5/2, pilot-pilot
1	Valve, shuttle	2	Valve, flow control
1	Reservoir	1	Automatics platform
1	Manifold	1	Tubing, red, 5 m
1	Tubing, yellow, 30 m	1	Tubing, blue, 30 m
4	Connector, tee junction	1	Tee bolts (pack of 50)
1	Tube cutting tool	1	Set of storage trays

Ordering information	
Automatics essentials solution	AU9020
You may also need...	
Compressor	AU1050



Suitable for unit 12 of the BTEC national: Pneumatic and hydraulic systems

Electro-pneumatics add-on kit

This kit supplements the Automatics essentials solution by adding a selection of electrically operated valves and a range of sensors. By following the curriculum, students will learn how to use these new components to create systems in which pneumatics and electrical circuits are combined into complete systems.

The electrical components are connected together quickly and reliably using 4mm connectors, for which all of the necessary leads and accessories are provided. Electrical components are robustly mounted to the Automatics platform using the same 'tee' bolt system used for the pneumatic parts and are printed with standard circuit symbols.

Working two to a kit, students follow the detailed worksheets to gain a comprehensive understanding of electro-pneumatics. By the end of the course, students will be able to create reciprocating and sequential circuits, and will have an understanding of how these are used to solve real world engineering problems.

Learning objectives

- Understand the operation of electrically controlled pneumatic valves
- Use of electrical switching to control circuit operation
- Using microswitches to sense cylinder position
- Sensing position without physical contact using reed switches
- Expressing electrical circuits using ladder diagrams
- Electrically operated reciprocal circuits
- Sequential control circuits
- Analysing real world problems and formulating solutions

Components included			
2	Reed switch and holder	2	Switch, push to make
2	Microswitch	1	Valve, 3/2, solenoid-spring
1	Valve, 5/2, solenoid -spring	2	Valve, double solenoid
6	Lead, 4mm plugs, black	6	Lead, 4mm plugs, red
1	Power supply		

Ordering information	
Electro-pneumatics add-on kit	AU9015
You may also need...	
Automatics essentials solution	AU9020

Suitable for unit 12 of the BTEC national: Pneumatic and hydraulic systems

Pneumatics control add-on kit

This kit extends your Automatics pneumatics solution by adding a powerful programmable microcontroller unit, the MIAC, together with the pneumatic components necessary to put it through its paces.

By following the included curriculum, students will learn how the combination of a controller and custom software can create powerful and flexible pneumatic systems.

Students will learn how to establish the state of a pneumatic machine using sensors, the use of logic to process that data and the issuing of commands to the included solenoid valves.

Two versions of the curriculum are supplied. In the first, students use pre-programmed control systems supplied in the MIAC's built in memory. A more advanced course, Control plus, teaches students how to write their own programs for the controller.

Learning objectives

- Reading sensors and switches
- Issuing commands to the pneumatic circuits
- Learning the difference between digital and analogue signals
- Using flowcharts to visualise programs
- Program flow and decision making
- Programming sequences
- Using feedback to enhance reliability and improve safety

Control Plus

This curriculum introduces students to writing their own programs for the control system.

This is done using our Flowcode software - which makes programming easy by using graphical flowcharts. Note that you may need to purchase Flowcode separately.

Components included			
1	MIAC controller	2	Switch, push to make
1	Reed switch and holder	2	Valve, flow control
1	Light sensor	4	Valve, 3/2, solenoid-spring
1	Power supply	1	Power distribution carrier
6	Lead, 4mm plugs, red	6	Lead, 4mm plugs, black
2	Lead, 4mm plugs, yellow		

Ordering information	
Automatics control add-on kit	AU9010

You may also need...	
Automatics essentials solution	AU9020
Flowcode	See page 62

Unit 24 of the BTEC Higher National award in Engineering : Applications of pneumatics and hydraulics

NEW

Unit 36 of the BTEC National: Programmable logic controllers.

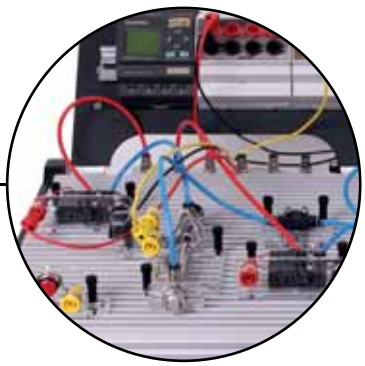
Unit 22 of the BTEC Higher National award in Engineering : Prorgammable logic controllers

Programmable logic controllers

We are now able to supply pneumatics training equipment which can be used with any PLC with the Automatics PLC adaptor rail. The Adaptor rail allows students to connect to relay and motor outputs using standard 4mm connectors which connect directly to other Automatics components. This pack combines standard pneumatics components with Control pneumatics components to provide a complete learning platform for pneumatics and PLC programming in one package. A PLC is not included. Any programming language - including ladder logic - can be used. Worksheets are based on flow charts. PLC adaptor modules included: power distribution, inputs (8), motor outputs (8), relays (4).

Learning objectives

- Pneumatic components, circuits and circuit diagrams
- Sensors and switches in pneumatic systems
- Digital and analogue signals
- PLC programming with ladder logic or block diagrams
- PLC inputs and outputs
- Logic functions



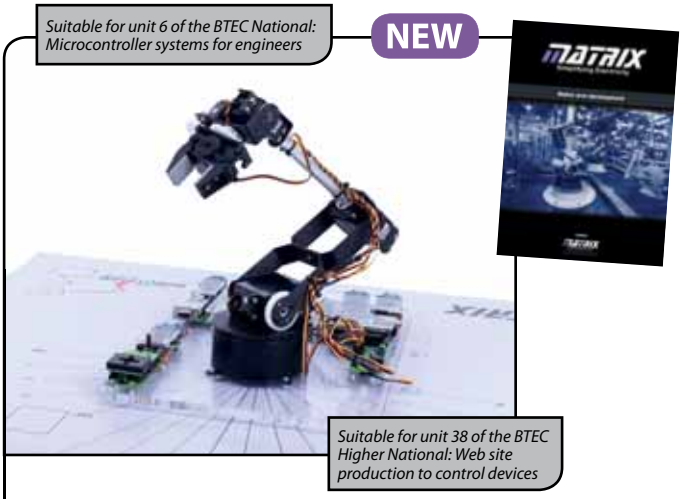
Works with Siemens S7, Mitsubishi, Omron or any standard PLC which fits onto a 50mm DIN rail.

MITSUBISHI SIEMENS OMRON A-B QUALITY

Ordering information	
Automatics Essentials	AU9020
PLC Adaptor - Input module	HP6700
PLC Adaptor - Power module	HP6711
PLC Adaptor - Motor module	HP6723
PLC Adaptor - Relay module	HP6752
PLC adaptor - mounting bracket	HP6785

Suitable for unit 6 of the BTEC National: Microcontroller systems for engineers

NEW



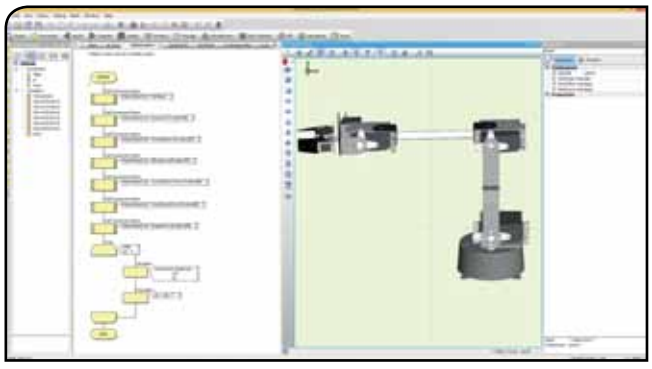
Suitable for unit 38 of the BTEC Higher National: Web site production to control devices

Robot arm production cell

Our new robot arm production cell consists of a rugged servo-controlled 6 degrees of freedom arm bolted to a base plate and mat that provides a range of exercises mimicking industrial robot arm production cells. The arm itself delivers fast, accurate, and repeatable movement with base rotation, single plane shoulder, elbow, wrist motion, a functional gripper, and a wrist rotator. The arm is controlled by a dsPIC microcontroller with combo board (16 switches, 16 LEDs, 2 line 16 character LCD, quad 7-seg display and sensors), colour sensor board and wi-fi board from our E-blocks range. The board can be programmed directly from Flowcode for dsPIC, or Microchip's MPLAB. A full Flowcode simulation is available free of charge. The control system is also shipped with a full Application Program Interface so that the robot can be controlled using any wi-fi enabled device such as a PC, Android, or Apple device using a range of software applications including C++, LabView, Python, and App Inventor as well as remote applications over the web. The kit is supplied with a number of coloured wooden blocks which can be moved by the arm into different locations in the work cell. A teacher's guide is available for download from our web site.

Learning objectives / experiments

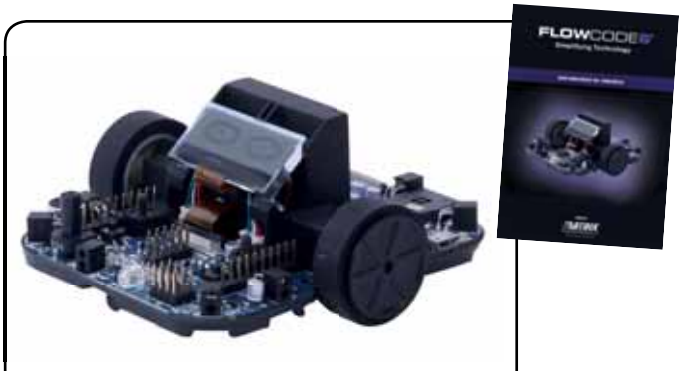
- Robot cell design and programming
- Microcontroller programming
- Sensors and actuators in robotics
- Kinematics: 3D movement in robotic systems
- Web based control
- Programming in many languages



Using Flowcode to simulate and program the robot arm

For an explanation of icons please see page 6

Ordering information	
Robot arm cell	RB6231
Corresponding curriculum	CP8656
Wi-fi add-on board	EB069
Bluetooth add-on board	EB024



Suitable for unit 6 of the BTEC National: Microcontroller systems for engineers

Introduction to Robotics

This training solution provides a course in robotics with a sequence of staged exercises including line following and maze solving. The course makes use of the high specification Formula AllCode robot which can be programmed with a number of languages on various operating systems including Flowcode, App Inventor, Python and LabView. This is great for introducing students to programming and robotics in a fun and motivating way with huge scope for further work and competitions. The solutions are supplied with a large double-sided task mat and a set of maze walls.

Learning objectives /experiments

- Microcontroller programming and robotics
- Programming concepts: input, system, output, loops, decision, subroutine, go to, calculations, delays, simple variables, A/D conversion
- Robotic components: switches, LEDs, light sensors, distance sensors, infrared sensors, audio level sensors, speaker, motor drivers, motors and gearboxes
- Robotic tactics including logo-like commands, power control, motion control and steering, motor characterisation, obstacle avoidance
- Progressive exercises include: light following, line following, song and dance, time trials, races, simple maze solving, creating custom mechanics

Playing robot football with Android phones.

See Formula AllCode section for full details

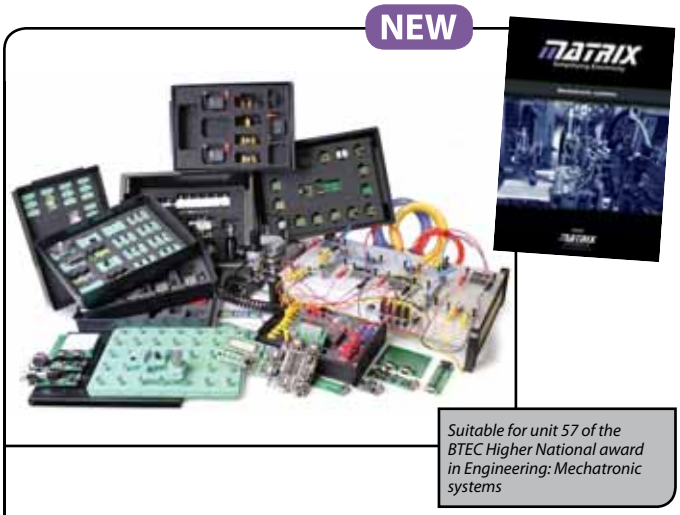
For an explanation of icons please see page 6

Ordering information	
Formula AllCode deluxe kit	RB7971
Formula AllCode standard class set	RB7240
Formula AllCode deluxe class set	RB7518
Corresponding curriculum	CP5894

Instrumentation included
Ghost and Flowcode provide:
- In-Circuit-Debug
- In-Circuit-Test
- Multi channel oscilloscope
- Multi channel logic analyser
- Multi channel packet decoder
- Data console display

See page 84

NEW



Suitable for unit 57 of the BTEC Higher National award in Engineering: Mechatronic systems

Mechatronic systems

This pack contains products from three of our ranges of equipment: Locktronics, E-blocks and Automatics. The pack includes a wide variety of resources suitable for studying mechatronics using three types of control system: a PIC microcontroller, a micro PLC, and a PC. Students can learn the basics of control using flow charts before progressing to other languages like C++ or LabView software (C++ and LabView not included). A wide range of curriculum is included in the packs covering Industrial sense and control, flow chart programming of microcontrollers, Industrial sense and control with C++ or LabView programming, and design of pneumatic control systems. Further curriculum options for programming in C or Assembly are available.

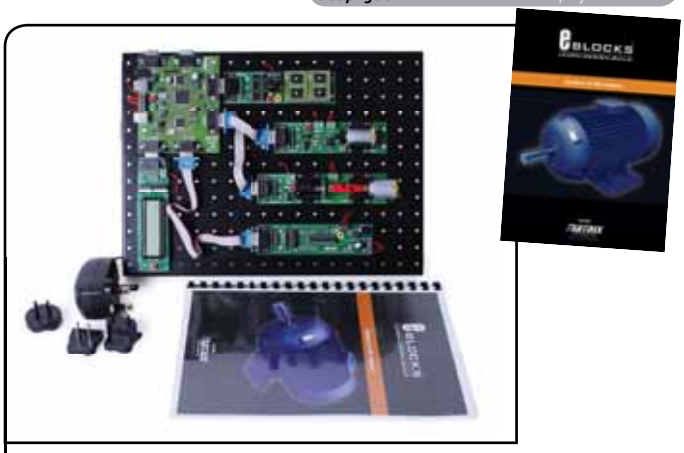
Learning objectives

- PIC and controller programming using flow charts
- Programming options: Embedded C, Assembly, C++ or LabView
- Mathematical models of sensors
- PID control of DC motors with speed and position (2nd order)
- Sensors: thermistor, light, thermocouple, rotary, Gyroscope, Hall effect, PIR, Cap touch, Magnetometer, Ultrasonic, Colour
- Actuators: relays, stepper motors, DC motors with feedback, servo motors

For an explanation of icons please see page 6

Components included			
1	Locktronics Industrial sense and control kit	1	DMOS motors power board
1	Sensors add-on pack	1	Compressor
1	Automatics essentials kit	1	Introduction to microcontrollers (online)
1	Automatics Control add-on kit	1	DC motor position training board (PID)
1	Standard PICmicro starter pack	1	DC motor speed training board (PID)

Ordering information	
Industrial sensors, actuators and control applications kit	FC6AC01NE
Mechatronic systems	HP4550



Motor control training course

This solution provides a practical and low cost way of allowing students to understand the techniques of controlling DC motors. The solution is based on dsPIC technology. The equipment consists of a number of E-blocks boards mounted on a metal backplane, a programmer board, a switch board, an LCD board, a motor power board, a DC motor velocity control board and a DC motor position control board. Students can undertake a range of exercises from simple speed and direction control through to complex control using PID techniques with velocity and position as key parameters.

Learning objectives / experiments

- Simple motor control – direction, speed
- Sensors in motor control systems: IR, F to V conversion, resistive
- PID control of velocity
- Servo systems
- PID control of position
- First and second order functions
- Flowchart programming using Flowcode
- Programming using C/C++

Instrumentation included
Ghost and Flowcode provide:
- In-Circuit-Debug
- In-Circuit-Test
- Multi channel oscilloscope
- Multi channel logic analyser
- Multi channel packet decoder
- Data console display

See page 84

For an explanation of icons please see page 6

Components included			
1	Backplane	1	Flowcode v6 academic license
1	Motors power board	1	DC motor velocity control board
1	DC motor position control board	1	dsPIC board
1	Sensors board	1	LCD board

Ordering information	
Motor control training course	EB8493
Corresponding curriculum	HP3096

NEW

Dynamic seat

This full size electronic seat allows students to make a study of electromechanical system design from the perspectives of the mechanics, the electronic control system, the energy and the programming. The bucket seat is constructed from rugged metal sections and is powered by two DC motors.

The system is controlled using E-blocks based on PIC technology housed in a metal cabinet fitted with basic controls. Workbooks provide around 40 hours of study across a number of separate engineering disciplines which gives students a good understanding of the key issues in the design of electromechanical systems. Requires 220VAC.

Learning objectives / experiments

- Mechanics: Mechanical design and system modelling using Solidworks (not supplied)
- Sensors: feedback using data from Hall sensors, accelerometers, encoders and potentiometers. Use accelerometer feedback to determine position
- Actuators: PWM control of motors speed and acceleration.
- Kinematics: simulation of systems and analysis of movement and degrees of freedom
- Energy: function of energy pathways, energy storage and usage
- Control: using a PC with LabView (not supplied) or with a PIC using Flowcode (supplied)
- Modelling of complete electromechanical systems using Flowcode
- Electromechanical control using Lab-View

For an explanation of icons please see page 6

Ordering information	
Dynamic seat	HP8834