

# PRODUCT PORTFOLIO

ENGINEERING EXCELLENCE IN EDUCATION



TECQUIPMENT



ISSUE 2



[TECQUIPMENT.COM](https://www.tecquipment.com)



# WELCOME TO THE TECQUIPMENT PRODUCT PORTFOLIO
















With the digital version you will notice links to **VIDEOS** to watch, **DATASHEETS** to view, ancillary **FLYERS** to download and more **INTERACTIVE** content to make your research into TecQuipment's teaching apparatus quick and easy.



INTERACTIVE  
DIGITAL VERSION

If you have any questions please either contact us directly by emailing [sales@tecquipment.com](mailto:sales@tecquipment.com) or contact your local TecQuipment Sales Partner who can be found on the website at [tecquipment.com/sales-partners](http://tecquipment.com/sales-partners).

# ≡ CONTENTS

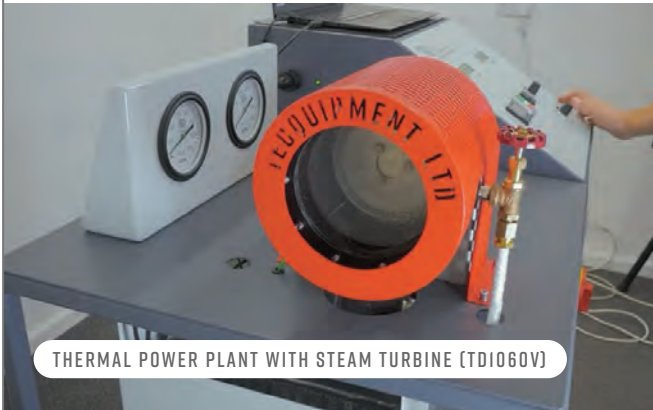
ENGINEERING SCIENCE	3	
AERODYNAMICS	8	
CONTROL ENGINEERING	13	
PROCESS CONTROL ENGINEERING	15	
FLUID MECHANICS	17	
MATERIALS TESTING AND PROPERTIES	30	
STATICS FUNDAMENTALS	35	
NEXT GENERATION STRUCTURES	36	
THEORY OF MACHINES	42	
THERMODYNAMICS	46	
ENGINES	52	
ENVIRONMENTAL CONTROL	55	
ALTERNATIVE ENERGY	57	
VERSATILE DATA ACQUISITION SYSTEM (VDAS®)	59	
OPTICAL EXTENSOMETRY	60	
GENERAL-PURPOSE ANCILLARIES AND INSTRUMENTS	61	
PRODUCT LIST	62	
CONTACTING TECQUIPMENT	64	
CASE STUDY: BEDFORD COLLEGE	65	
CASE STUDY: KENT STATE UNIVERSITY	66	
CASE STUDY: YORK COLLEGE OF PENNSYLVANIA	67	
CASE STUDY: NAZARBAYEV UNIVERSITY	68	



## PLAY NOW - TECQUIPMENT YOUTUBE CHANNEL



Visit and subscribe to the TecQuipment YouTube channel for all the latest products showcases, installation and user videos: [YOUTUBE.COM/@TECQUIPMENT/VIDEOS](https://www.youtube.com/@TECQUIPMENT/VIDEOS)



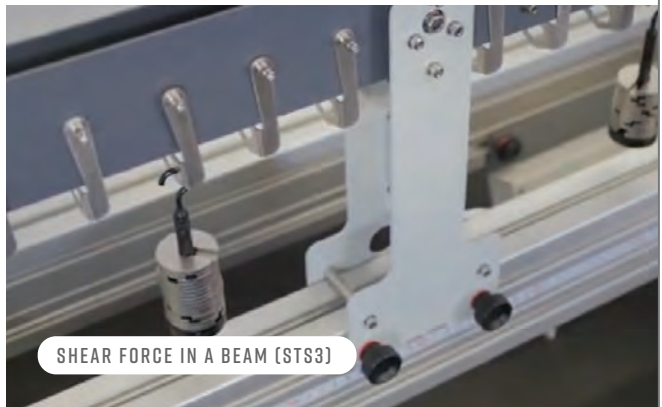
THERMAL POWER PLANT WITH STEAM TURBINE (TDI060V)



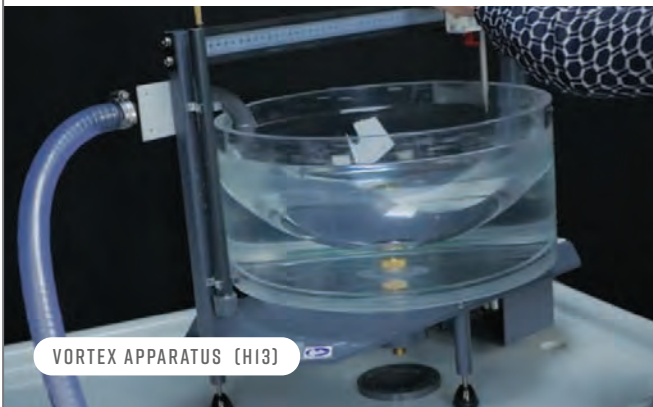
HYDRO-ELECTRIC TURBINE (AE1000V)



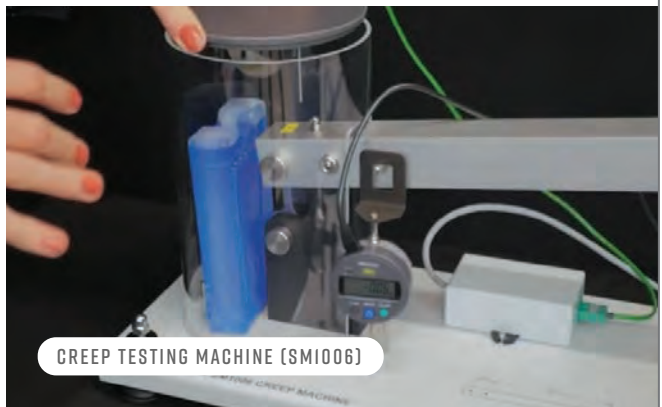
FLOW VISUALISATION WIND TUNNEL (AF80)



SHEAR FORCE IN A BEAM (STS3)



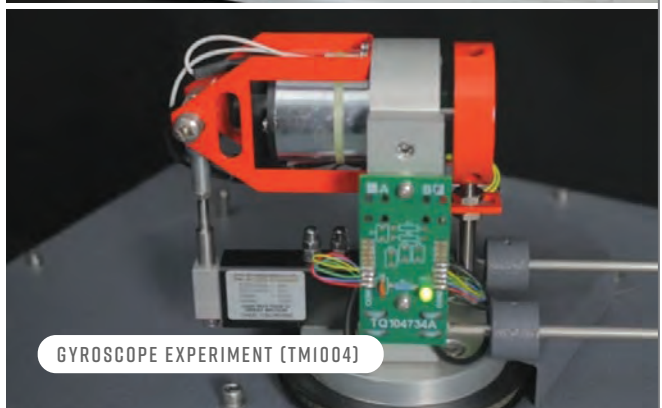
VORTEX APPARATUS (HI3)



CREEP TESTING MACHINE (SM1006)



FRICTION AND INCLINED PLANE KIT (ES8)



GYROSCOPE EXPERIMENT (TM1004)



# ENGINEERING SCIENCE

PACKAGES AND FRAME

SMART WORKSHEETS

FORCES AND MOMENTS

MATERIALS TESTING

VIBRATION, FRICTION AND ENERGY

SIMPLE MACHINES

MECHANISMS



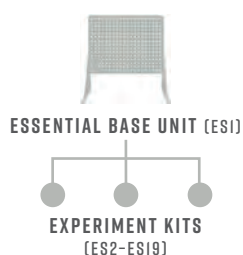
## ENGINEERING SCIENCE FULL SET ESF

A complete set of TecQuipment's Engineering Science kits and three work panels within a mobile trolley.

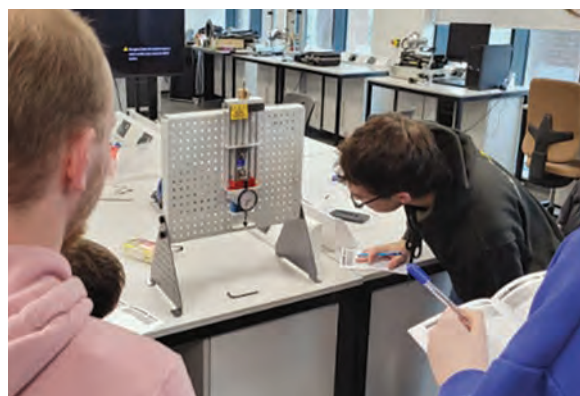


## WORK PANEL ESI

Multi-position work panel for use with TecQuipment's Engineering Science kits.



EXPERIMENT KITS POSTER



### AVAILABLE EXPERIMENT KITS:

Forces Kit (ES2)	4
Moments Kit (ES3)	4
Deflection of Beams and Cantilevers Kit (ES4)	5
Torsion of Circular Sections Kit (ES5)	5
Tensile Tester Kit (ES6)	5
Simple Harmonic Motion Kit (ES7)	5
Friction and Inclined Plane Kit (ES8)	5
Potential and Kinetic Energy Kit (ES9)	6
Pulley Kit (ES10)	6
Drive Systems Kit (ES11)	6
Cam, Crank and Toggle Kit (ES12)	6
Gear Trains Kit (ES13)	6
Simple Mechanisms Kit (ES14)	7
Bar Linkages Kit (ES15)	7
Centrifugal Force Kit (ES16)	7
Rotational Friction Kit (ES17)	7
Additional Mechanisms Kit (ES18)	7
Spring Tester Kit (ES19)	7

## PACKAGES

As well as the full set, these packages are also available which offer great value for money.

### FORCES AND MOMENTS KIT PACKAGE ESBI



TWO WORK PANELS ES1

+

- FORCES KIT ES2
- MOMENTS KIT ES3

### MATERIALS TESTING KIT PACKAGE ESB2



FOUR WORK PANELS ES1

+

- DEFLECTION OF BEAMS AND CANTILEVERS KIT ES4
- TORSION OF CIRCULAR SECTIONS KIT ES5
- TENSILE TESTER KIT ES6
- SPRING TESTER KIT ES9

### SIMPLE MACHINES KIT PACKAGE ESB3



FOUR WORK PANELS ES1

+

- PULLEY KIT ES10
- DRIVE SYSTEMS KIT ES11
- GEAR TRAINS KIT ES13
- CENTRIFUGAL FORCE KIT ES16

### MECHANISMS KIT PACKAGE ESB4



FOUR WORK PANELS ES1

+

- CAM, CRANK AND TOGGLE KIT ES12
- SIMPLE MECHANISMS KIT ES14
- BAR LINKAGES KIT ES15
- ADDITIONAL MECHANISMS KIT ES18

### VIBRATION, FRICTION AND ENERGY KIT PACKAGE ESB5



FOUR WORK PANELS ES1

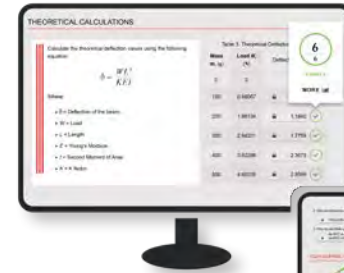
+

- SIMPLE HARMONIC MOTION KIT ES7
- FRICTION AND INCLINED PLANE KIT ES8
- POTENTIAL AND KINETIC ENERGY KIT ES9
- ROTATIONAL FRICTION KIT ES17

## SMART WORKSHEETS ESSW

### ESSW

Enhancing teaching capabilities and complementing students' learning with the use of ready-made, online and auto-graded assessments that are compatible with selected experiment kits in the Engineering Science range.



Worksheets currently available:

### FORCES AND MOMENTS (ES2 and ES3):

- Centre of Gravity
- Triangle of Forces
- Principle of Moments
- Levers

### DEFLECTION OF BEAMS (ES4):

- Beam Load
- Beam Dimensions
- Beam Length

### TORSION (ES5):

- Torque and Diameter

### STRENGTH OF MATERIALS (ES6):

- Tensile Testing

### DRIVE SYSTEMS (ES11 and ES13):

- Chain Drive
- Belt Drive
- Spur Gears

### SIMPLE MECHANISMS (ES14):

- Crank and Slider

## FORCES KIT ES2 ESSW

Demonstrates how to find the centre of gravity of shapes and the relationship between angles and coplanar forces, using force triangles.



## MOMENTS KIT ES3 ESSW

### ES3 ESSW

Demonstrates the relationship between distances and forces in rigid beams and levers showing the first, second and third order levers.





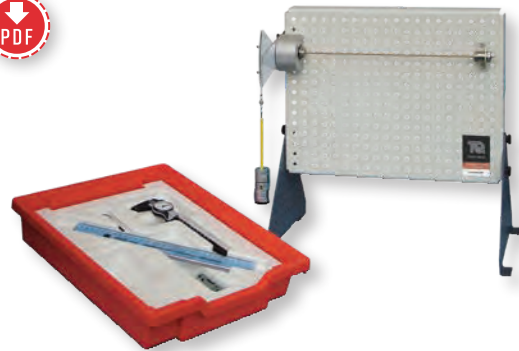
## DEFLECTION OF BEAMS AND CANTILEVERS KIT ES4

Demonstrates the deflection of beams of different materials and dimensions, held on different supports, both clamps and knife edges.



## TORSION OF CIRCULAR SECTIONS KIT ES5

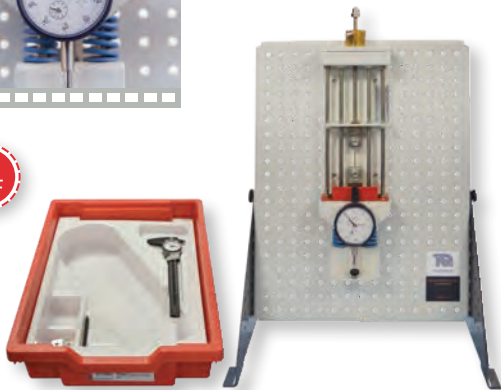
Demonstrates the torsion in circular section specimens of different materials and lengths.



## TENSILE TESTER KIT

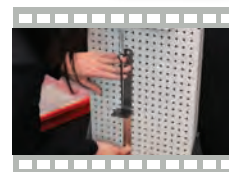
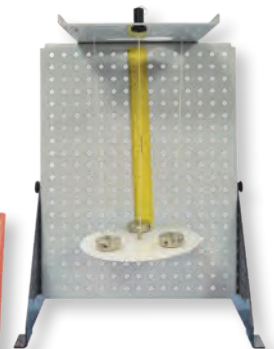
ES6

Demonstrates the principles of tensile tests on specimens of different materials, showing material behaviour in the elastic and plastic region (Young's modulus).



## SIMPLE HARMONIC MOTION KIT ES7

Demonstrates simple harmonic motion (oscillation) in springs and pendulums, and its usefulness.



SIMPLE HARMONIC MOTION EXPERIMENT

## FRICTION AND INCLINED PLANE KIT ES8

Demonstrates kinetic and static sliding friction and rolling friction on bodies and between different surfaces on a flat or inclined plane.



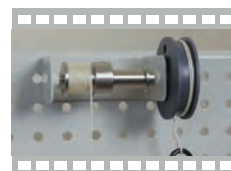
## POTENTIAL AND KINETIC ENERGY KIT ES9

Demonstrates the difference between potential and kinetic energy and how it can change from one to the other using a pendulum or flywheel. Also demonstrates elastic potential energy in a spring.



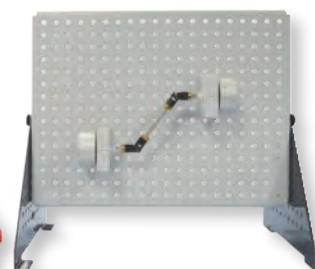
## PULLEY KIT ES10

Demonstrates the mechanical advantage of different combinations of pulleys and a simple wheel and axle.



## DRIVE SYSTEMS KIT ES11 ESSW

Demonstrates the advantages and disadvantages of three popular drive systems (belt, chain and a universal coupling) using a manually rotated frame with a low-friction cantilever linkage, adjustable masses and a spring to apply force.



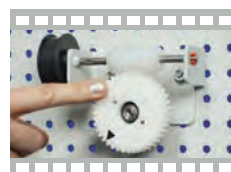
## CAM, CRANK AND TOGGLE KIT ES12

Demonstrates the characteristics of a mechanical toggle, crank motion and the most popular shaped cams: pear, heart, round and snail.



## GEAR TRAINS KIT ES13 ESSW

Demonstrates the characteristics of a spur gear, bevel gear and a worm drive.





## SIMPLE MECHANISMS KIT

ES14

Demonstrates how the Scotch yoke, crank and slider and quick return mechanisms convert motion.



## BAR LINKAGES KIT ES15

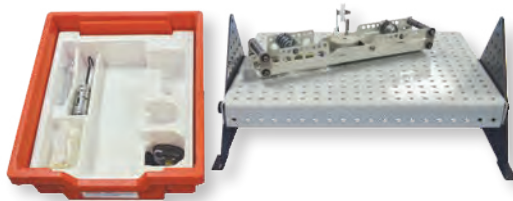
A set of bars and pivot joints for students to understand different bar linkages and mechanisms.



## CENTRIFUGAL FORCE KIT

ES16

Demonstrates the relationship between centrifugal force, radius and velocity of rotating masses.



## ROTATIONAL FRICTION KIT ES17

Demonstrates how rotational friction affects the efficiency of popular machine elements, including a screw jack, wedge and different bearings.



## ADDITIONAL MECHANISMS KIT ES18

Demonstrates how the Geneva mechanism and a ratchet mechanism convert motion.



## SPRING TESTER KIT ES19

Demonstrates the characteristics of coiled springs and how to test them (Hooke's law).

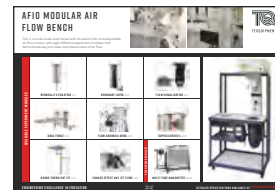


# AERODYNAMICS

SUBSONIC WIND TUNNELS  
SPECIAL PURPOSE WIND TUNNELS  
SUPERSONIC NOZZLE  
SUPERSONIC WIND TUNNELS

## MODULAR AIR FLOW BENCH AF10

This is a small-scale wind tunnel with an electric fan and adjustable air flow control, with eight different experiment modules that demonstrate key principles and phenomena of air flow.



EXPERIMENT MODULES POSTER



### AVAILABLE EXPERIMENT MODULES:

- Bernoulli's Equation (AF11) 8
- Drag Force (AF12) 8
- Round Turbulent Jet (AF13) 9
- Boundary Layer (AF14) 9
- Flow Around a Bend (AF15) 9
- Coandă Effect and Jet Flow (AF16) 9
- Flow Visualisation (AF17) 9
- Tapped Aerofoil (AF18) 9

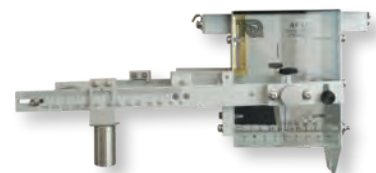
## BERNOULLI'S EQUATION AF11

Allows students to measure the pressure distribution in a convergent-divergent duct to confirm Bernoulli's equation.



## DRAG FORCE AF12

Allows students to investigate the direct and indirect measurement of drag on various shapes and to calculate and analyse the drag coefficient by different methods.





## ROUND TURBULENT JET AF13

Allows students to investigate a jet of air as it emerges from the end of a tube and analyse its properties.



## BOUNDARY LAYER AF14

Allows students to investigate both the laminar and turbulent boundary layers on flat plates with rough and smooth surfaces.



## FLOW AROUND A BEND AF15

Allows students to measure the pressure distribution in a smooth rectangular bend via tapping points on the curved walls and radius.



## COANDĂ EFFECT AND JET FLOW AF16

Allows students to investigate the Coandă effect and a fluidic flip-flop.



## FLOW VISUALISATION AF17

Allows students to 'see' the air flow around various shapes by using smoke filaments. The shapes are viewed through a transparent window.



## TAPPED AEROFOIL AF18

Allows students to investigate the pressure distribution around a two-dimensional NACA aerofoil that has 12 tapping points along the chord.



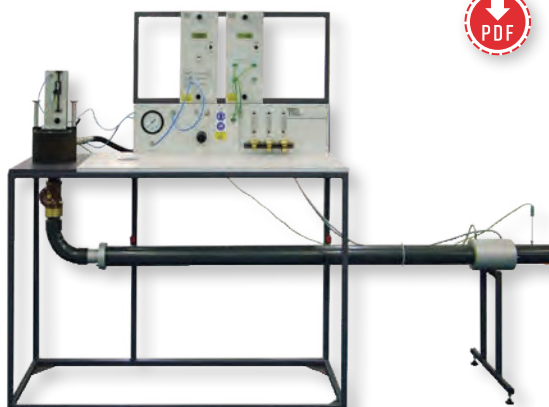
## FLOW VISUALISATION WIND TUNNEL AF80

A vertical suction-type wind tunnel that uses smoke trails to demonstrate air flow around differently shaped models, for understanding boundary layers, separation and rotational flow.



## LAVAL NOZZLE FLOW APPARATUS AF27 VDAS®

Demonstrates the thermodynamic and fluid mechanics of the adiabatic expansion of air through subsonic and supersonic nozzles. Includes interchangeable convergent, convergent/divergent Laval nozzles and convergent/parallel nozzle.





## SUBSONIC WIND TUNNEL 305 MM AF1300 **VDAS®**

A compact, free-standing, open-circuit suction subsonic wind tunnel with a working section of 305 mm by 305 mm and 600 mm long, allowing students to perform advanced study such as analysing boundary layers, performing flow visualisation and observing velocity in the wake, offering extensive teaching and research functionality.



### EXPERIMENT MODELS:

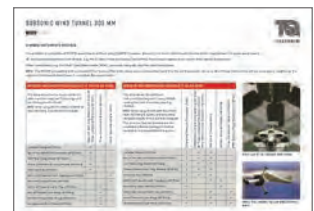
- Cylinder Model with Tapping (AF1300a)
- NACA 0012 Aerofoil with Tappings (AF1300b)
- NACA 2412 Aerofoil with Flap (AF1300c)
- Set of Two NACA 0012 Aerofoils (AF1300d)
- Flat Plate Drag Model (AF1300e)
- Boundary Layer Model (AF1300f)
- Aircraft Model (Low Wing) (AF1300g)
- Aircraft Model (High Wing) (AF1300h)
- Three-Dimensional Drag Models (AF1300j)
- S1210 Aerofoil (AF1300l)
- Winglets and End Plates (AF1300q)
- Flutter Wing (AF1300r)



WINGLETS AND END PLATES



FLUTTER WING



INSTRUMENTATION REQUIREMENT CHART



MODELS AND INSTRUMENTATION POSTERS

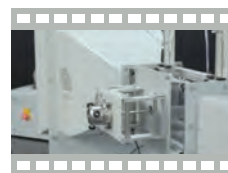
A starter set is available consisting of the Subsonic Wind Tunnel 305 mm (AF1300), Basic Lift and Drag Balance (AF1300z) and a set of Three-Dimensional Drag Models (AF1300j).





## BENCHTOP SUBSONIC WIND TUNNEL AF1125

An ultra-compact, open circuit, benchtop subsonic wind tunnel that offers a complete system ready for aerodynamic experimentation, suitable for college use, undergraduate study and research projects.



## SUBSONIC WIND TUNNEL 450 MM AF1450S VDAS®

Larger open-circuit, suction subsonic wind tunnels for the study of advanced aerodynamics theory and research. With a working section of 450 mm or 600 mm comes greater visualisation and more accurate results, operating at meaningful Reynolds numbers.



MODELS AND INSTRUMENTATION POSTERS



FULLY OPERATION WIND TUNNEL



## SUBSONIC WIND TUNNEL 600 MM AF1600S VDAS®



Larger open-circuit, suction subsonic wind tunnels for the study of advanced aerodynamics theory and research. With a working section of 450 mm or 600 mm comes greater visualisation and more accurate results, operating at meaningful Reynolds numbers.



MODELS AND INSTRUMENTATION POSTERS



## FLIGHT DEMONSTRATION WIND TUNNEL AF41V



A model aircraft suspended in an open circuit wind tunnel. Includes realistic fly-by-wire flight controls to simulate a variety of principles of aircraft flight.



## INTERMITTENT SUPERSONIC WIND TUNNEL AF300

VDAS®

An intermittent supersonic (up to Mach 1.8) wind tunnel for investigations into subsonic and supersonic air flow around two-dimensional models. Also for analysis of the profile of the tunnel working section.



## CONTINUOUS SUPERSONIC WIND TUNNEL AF302

VDAS®

A suction-type, continuous-operation supersonic (up to Mach 1.8) wind tunnel for investigations into subsonic and supersonic air flow around two-dimensional models. Also for analysis of the profile of the tunnel working section.



## SCHLIEREN APPARATUS AF300A / AF302A

The Schlieren apparatus enables students to see air flow (including supersonic shock waves) around two-dimensional models as variations in the intensity of illumination. For use with the Intermittent (AF300) and Continuous (AF302) Supersonic Wind Tunnels.



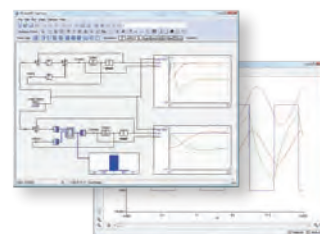
5 DEGREES MACH 1-8 AND  
5 DEGREE WEDGE





## CONTROL SOFTWARE CE2000

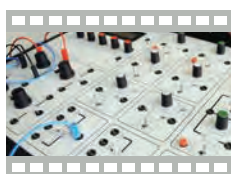
Software that simulates control systems and works with TecQuipment's controller (CE120) or digital interface (CE122) to control and acquire data from TecQuipment's Control Engineering range.



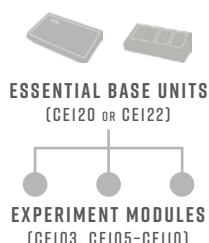
## CONTROLLER

CE120

A self-contained analogue and computer-based controller designed to support practical investigations into the basic and advanced principles of control engineering at all academic levels.



EXPERIMENT MODULES POSTER



## DIGITAL INTERFACE CE122

A self-contained computer-based controller designed to support practical investigations, covering the basic and advanced principles of control engineering at all academic levels.



### AVAILABLE EXPERIMENT MODULES:

- |   |    |
|---|----|
| • Thermal Control Process Apparatus (CE103) | 13 |
| • Coupled Tanks Apparatus (CE105/CE105MV)   | 14 |
| • Ball and Beam Apparatus (CE106)           | 13 |
| • Engine Speed Control Apparatus (CE107)    | 14 |
| • Coupled Drives Apparatus (CE108)          | 14 |
| • Ball and Hoop Apparatus (CE109)           | 14 |
| • Servo Trainer (CE110)                     | 14 |

## THERMAL CONTROL PROCESS APPARATUS CE103

A self-contained benchtop temperature control apparatus that mimics common industrial processes, designed to allow students at all academic levels to investigate the basic and advanced principles of control.



## BALL AND BEAM APPARATUS

CE106

A self-contained benchtop apparatus to demonstrate basic and advanced principles of control in naturally unstable systems.





## COUPLED TANKS APPARATUS CE105

A self-contained benchtop apparatus to demonstrate basic and advanced principles of control of single and coupled tanks, including the study of static and dynamic systems.



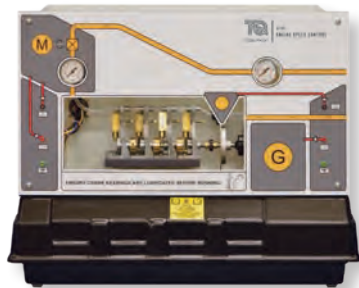
### MULTIVARIABLE COUPLED TANKS APPARATUS CE105MV

Based on the CE105 but features a second pump and flow metre for more advanced experiments on the principles of multivariable control.



## ENGINE SPEED CONTROL APPARATUS CE107

A self-contained benchtop apparatus to demonstrate basic and advanced principles of engine speed control, including non-linear systems and inner loop feedback techniques.



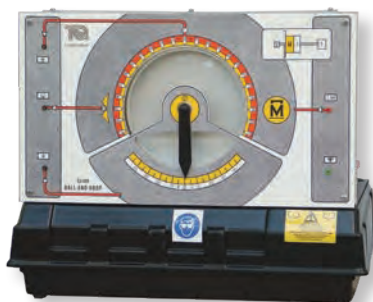
## COUPLED DRIVES APPARATUS CE108

Compact benchtop apparatus designed to allow students at all academic levels to investigate basic and advanced principles of control, including control of multi-variable systems.



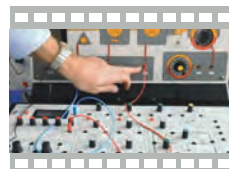
## BALL AND HOOP APPARATUS CE109

A self-contained benchtop apparatus to demonstrate basic control of position or speed of a ball in a hoop, and more advanced studies of liquid slop.



## SERVO TRAINER CE110

A self-contained benchtop DC servo apparatus to study basic control of speed of a servomotor, through to more advanced optional controllers or other suitable controllers.





# PROCESS CONTROL ENGINEERING

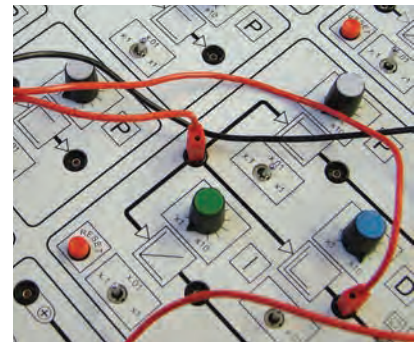
DIGITAL CONTROL  
PROCESS CONTROL



PROCESS CONTROL ENGINEERING

## PLC TRAINER CE123

Uses an industry-standard PLC to control the PLC process using ladder logic programming running on a PC. For use with the PLC Process (CE111).



## PLC PROCESS CE111

A self-contained, benchtop liquid flow and level process, providing a physical system to experience the programming of programmable logic controllers, for use with the PLC Trainer (CE123).



## PROCESS TRAINER CE117

A self-contained, benchtop, fully integrated teaching apparatus that mimics industrial process engineering, including a comprehensive range of experiments in flow, level, pressure and temperature, ranging from basic theories through to more advanced principles.

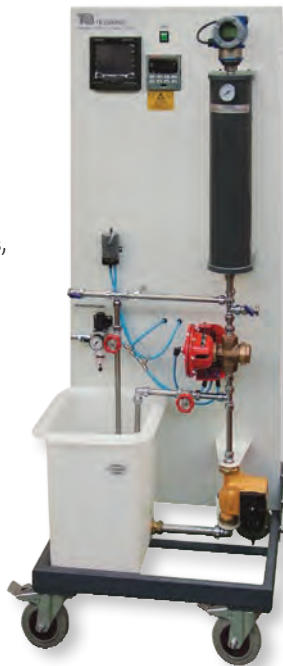






## PRESSURE PROCESS TRAINING SYSTEM TE3300/02

A self-contained, mobile module using pressure as the control variable to illustrate the principles of single-loop control and the calibration and tuning of controllers, transmitters, converters and valves.



## FLOW PROCESS TRAINING SYSTEM

TE3300/03

A self-contained, mobile module for flow process control experiments to illustrate the principles of single-loop control and the calibration and tuning of controllers, transmitters, converters and valves.



## LEVEL PROCESS TRAINING SYSTEM TE3300/04

A self-contained, mobile module for level process control experiments to illustrate the principles of single-loop control and the calibration and tuning of controllers, transmitters, converters and valves.



## TEMPERATURE PROCESS TRAINING SYSTEM TE3300/05

A self-contained, mobile module for temperature process control experiments to illustrate the principles of single-loop control and the calibration and tuning of controllers, transmitters, converters and valves.



## COMPUTER CONTROL SYSTEM TE3300/06

Easy-to-use software that connects to the TE3300 Process Control modules for remote control and monitoring of processes (distributed control).



# FLUID MECHANICS

## DIGITAL HYDRAULIC BENCH

### FLOW AND PRESSURE MEASUREMENT

### PIPE FRICTION AND ENERGY LOSS

### LAMINAR AND TURBULENT FLOW

### NOZZLES AND JETS

### VORTICES AND CAVITATION

### PIPE SURGE AND WATER HAMMER

## OPEN CHANNEL FLOW

## HYDROSTATICS AND PROPERTIES OF FLUIDS

## HYDROLOGY

## PUMPS AND TURBINES

## MODULAR FLUID POWER (PUMPS, TURBINES AND COMPRESSORS)

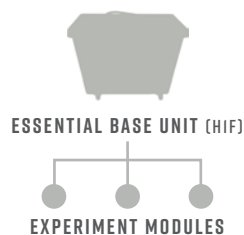
## DIGITAL HYDRAULIC BENCH H1F

A mobile, self-contained bench with recirculating water supply. It provides water at variable flow rates direct to experiments and includes digital flow display for hydraulic and fluid mechanics experiments.



### EXPERIMENT MODULES:

- Flow Visualisation (FC15) 18
- Bernoulli's Theorem (H5) 18
- Discharge Over a Notch (H6) 18
- Flow Measurement Methods (H10) 18
- Friction Loss in a Pipe (H7) 19
- Pipework Energy Losses (H34) 19
- Flow Meter Calibration (H40) 19
- Losses in Piping Systems (H16) 19
- Impact of a Jet (H8) 20
- Flow Through an Orifice (H4) 20
- Fluid Friction Apparatus (H408) 20
- Vortex Apparatus (H13) 21
- Jet Trajectory and Orifice Flow (H33) 21
- Pipe Surge And Water Hammer (H405) 21
- 2.5 Metre Flume (FC50-2.5) 22
- Francis Turbine (H18) 25
- Pelton Turbine (H19) 25
- Hydraulic Ram Pump (H31) 25



EXPERIMENT MODULES POSTER

Upgrade your older generation gravimetric or volumetric hydraulic bench with a:



### DIGITAL ELECTRONIC MEASURING KIT H1X

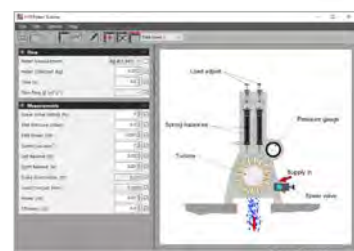
For measuring low flow rates of water being used in experiments:



### LOW FLOW RANGE DISPLAY H1L

## HDMS SOFTWARE HDMS HDMS

A user-friendly, simple software tool for manual data entry and recording of data for many of TecQuipment's hydraulics experiments.



## FLOW VISUALISATION FC15

A compact, entry-level piece of equipment for visualising flow patterns around weirs and other objects in an open channel. Can also be used with the included lock gates to perform wave flow experiments.



## DISCHARGE OVER A NOTCH H6 HDMS

A tank and set of notch weirs for the study of flow regulation and measurement devices.



## BERNOULLI'S THEOREM H5 HDMS

A benchtop Venturi tube that allows students to study Bernoulli's theorem by measuring the complete static head distribution along the horizontal tube.



## PRESSURE MEASUREMENT BENCH H30

A self-contained, benchtop apparatus that enables a range of practical investigations into manometer and Bourdon gauge pressure measurement techniques, including inclined and U-tube manometers, and Bourdon-type vacuum and pressure gauges.



## FLOW MEASUREMENT METHODS H10 HDMS

A Venturi meter, an orifice plate meter and a rotameter that demonstrate typical methods of measuring the flow of an incompressible fluid and show applications of Bernoulli's equation.







## CALIBRATION OF A BOURDON PRESSURE GAUGE H3A

A Bourdon pressure gauge with visible working mechanism to demonstrate how this type of pressure gauge works and how to calibrate it.



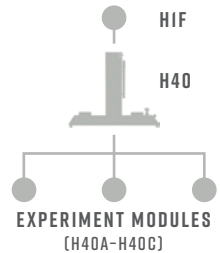
## FLOW METER CALIBRATION

**H40** **HDMS**

A compact manometer and nozzle flow meter that compares and demonstrates the accuracy, losses and use of fundamental flow meters.



ESSENTIAL BASE UNITS



EXPERIMENT MODULES:



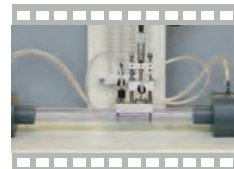
Pitot Tube (H40a)



Venturi Flow Meter (H40b)



Orifice Flow Meter (H40c)



## FRICTION LOSS IN A PIPE

**H7** **HDMS**

A small-bore straight test pipe on a base plate for measuring friction loss in a horizontal pipe, to study laminar and turbulent flow. Also to find the critical Reynolds number and demonstrate the flow transition point.



## PIPEWORK ENERGY LOSSES H34 **HDMS**

Compact, benchtop apparatus compares pressure losses and  $k$  value of popular fittings in small-bore pipework.



## LOSSES IN PIPING SYSTEMS H16

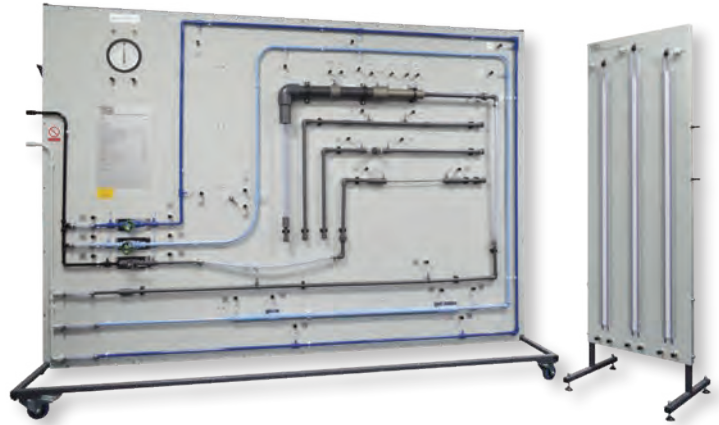
Free-standing, mobile apparatus demonstrates pressure losses in several small-bore pipe circuit components, typical of those found in central heating systems.



## FLUID FRICTION APPARATUS

H408 HDMS

A mobile vertical panel featuring various pipe configurations to demonstrate flow and losses in different pipes, fittings and valves. Includes Pitot tube, Venturi and orifice meters for flow measurement.



## OSBORNE REYNOLDS APPARATUS

H215

Free-standing apparatus that gives a visual demonstration of laminar and turbulent flow. It also allows students to investigate the effect of varying viscosity and investigate Reynolds numbers.



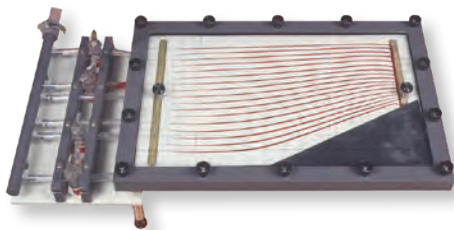
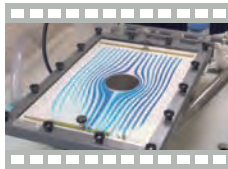
OPTIONAL HEATER MODULE (H215A)



## HELE-SHAW APPARATUS

H9

A benchtop apparatus to demonstrate two-dimensional laminar flow around differently shaped models, allowing the study of various source and sink arrangements.



## FLOW THROUGH AN ORIFICE

H4 HDMS

A cylindrical tank with an adjustable diffuser that demonstrates flow through different orifices for different flow rates.



## IMPACT OF A JET

H8 HDMS

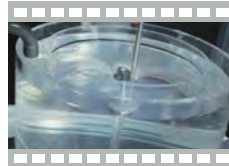
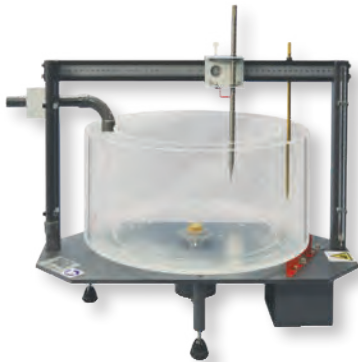
A cylindrical tank for investigating the force generated by a jet striking plates (representing turbine vanes) to aid in the understanding of how turbines work.



## JET TRAJECTORY AND ORIFICE FLOW

H33 **HDM S**

A constant head device, backboard, set of nozzles and Pitot tube. This apparatus demonstrates vertical flow and horizontal jet trajectories through different orifices (nozzles) and allows students to study the trajectory profiles of water jets from the nozzles when mounted horizontally.



## VORTEX APPARATUS H13 **HDM S**

A transparent, double-walled vessel that demonstrates the phenomena of free and forced vortices with measuring devices for calculating the water surface profile.



## CAVITATION IN A VENTURI H400

A floor-standing, self-contained apparatus to demonstrate and observe the basic principles of cavitation and its implications on the performance of hydraulic machines and systems.



## PIPE SURGE AND WATER HAMMER H405 **VDAS**

A self-contained unit for teaching the transient effects of pipe surge and water hammer caused by sudden flow rate changes in pipes.





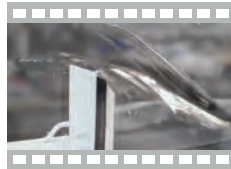
## 2.5-METRE FLUME FC50-2.5 **HDMS**

A 53 mm wide, 2.5 metre long flume complete with models and instruments for demonstrating flow around weirs and other objects in an open channel.



### AVAILABLE ANCILLARIES:

- Flow Visualisation (FC50di)
- Roughened Bed: 2 grades (FC50k)



MODELS POSTER



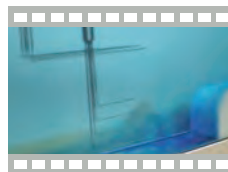
## FLOW AND SEDIMENT TRANSPORT CHANNELS FC80 (2.5, 5 AND 7.5)

An 80 mm wide, 2.5, 5 and 7.5-metre long flow and sediment transport channel with a starter kit of models and instruments. It provides students with the ability to study the varying effects of sediment transport, bedform dynamics and fluid flow around weirs and other objects in an open channel.

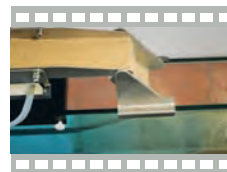


### AVAILABLE MODELS:

- Cylindrical Gate (FC80a)
- Radial Sector Gate (FC80b)
- Sluice Gate and Dye Kit (FC80c)
- Crump Weir (FC80d)
- Dam Spillway (FC80e)
- Streamlined Hump (FC80g)
- Parshall Flume (FC80h)
- Bridge Piers (FC80j)
- Roughened Beds (FC80k)
- Siphon Spillway (FC80l)
- Wave Generator and Beach (FC80n)
- Culvert Model (FC80p)
- Flow Splitter (FC80u)
- Flow Visualisation (FC80di)
- Sediment Feeder (FC80sf)



FLOW VISUALISATION



SEDIMENT FEEDER



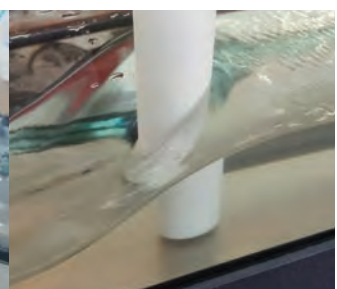
MODELS POSTER



7.5-METRE SEDIMENT  
TRANSPORT CHANNEL



FLOW UNDER A SLUICE GATE



SUBCRITICAL AND CRITICAL FLOW  
PAST A PIER

## FLUMES FC300 (5, 7.5, 10, 12.5 AND 15 METRES) VDAS®

A 300 mm wide, 5 to 15-metre long flume for student study and advanced research into a wide range of fluid flow topics. A huge range of ancillaries are available to extend learning potential and offers the opportunity for innovative experimentation.

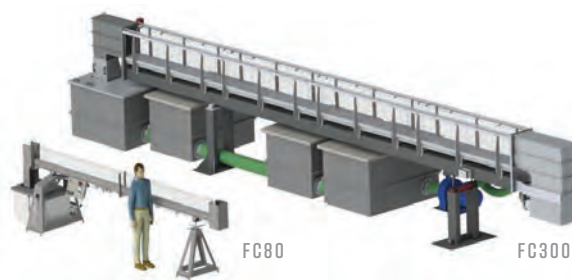


### AVAILABLE MODELS:

- Radial Gate (FC300b)
- Sluice Gate with Tappings (FC300c)
- Dam Spillway (FC300e)
- Ogee Weir with Tappings (FC300e2)
- Energy Dissipation (FC300e3)
- Siphon Spillway (FC300l)
- Self-Regulating Siphon (FC300l2)
- Venturi Flume (FC300f)
- Parshall Flume (FC300h)
- Culvert Model (FC300p)
- Trapezoidal Flume (FC300z)
- Bridge Piers (FC300j)
- Vortex-Induced Vibrations (FC300m)
- Roughened Beds (FC300k)
- Lift and Drag (FC300ld)
- Crump Weir (FC300d)
- Notched Weirs (FC300q)
- Broad-Crested Weirs (FC300r)
- Sediment Loop (FC300sl)
- Wave Generator and Beach (FC300n)



MODELS POSTER



## WATER HAMMER APPARATUS

### TE86

A 60-metre copper coil that demonstrates water hammer and cavitation and the propagation of shock waves at sonic velocity in water.



## METACENTRIC HEIGHT AND STABILITY H2 MKII

A benchtop apparatus to determine the stability of a pontoon with its centre of gravity, metacentric height and metacentre at various heights.



## HYDROSTATICS AND PROPERTIES OF FLUIDS H314

Self-contained mobile unit for many experiments in fluid mechanics. Among other experiments it covers: properties of fluids, hydrostatic principles and buoyancy/floatation and Archimedes principle.



### VISCOSITY AND PARTICLE DRAG

H410

Floor-standing, simple falling sphere viscometer that demonstrates the drag coefficient of different sized particles (spheres) and the viscosity of liquids.



### LIQUID SEDIMENTATION APPARATUS H311

A self-contained, benchtop apparatus of transparent sediment columns for studies into the settling characteristics of suspended solids and the display of particle wall effects.



### CENTRE OF PRESSURE H11

A pivoted, clear plastic assembly which students use to find the centre of pressure of a totally or partially submerged plane surface. Compact, self-contained and excellent for classroom demonstrations.

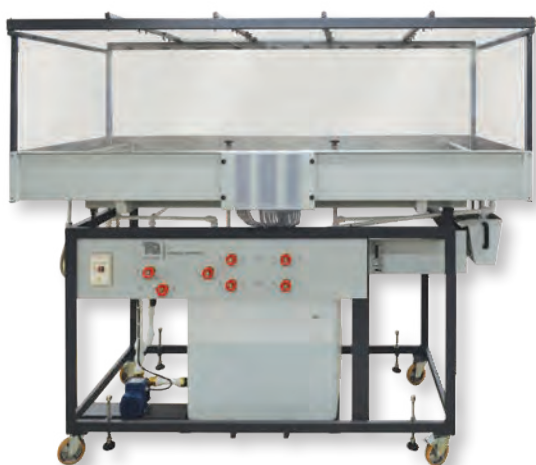


### PERMEABILITY, FLOW NETS AND DARCY'S LAW H312

A self-contained, floor-standing unit consisting of a tank with tappings connected to a bank of piezometer tubes. It demonstrates flow through permeable media with common structures, such as dams and walls.







## HYDROLOGY AND RAINFALL APPARATUS H313

A self-contained, floor-standing unit consisting of a water reservoir and a tank for sand with overhead spray nozzles that simulate rainfall, both stationary and moving. It is for studying hydrology principles, including rainfall, through flow and the movement of water over land and rivers.



## ADVANCED HYDROLOGY AND RAINFALL APPARATUS

H313V **VDAS**  
ONBOARD

This is the latest version of the Hydrology and Rainfall Apparatus, the H313, with new functionality for more detailed and advanced study including VDAS® Onboard.



## FRANCIS TURBINE H18 HDMS

A compact experiment for use with the Hydraulic Bench (H1F) to demonstrate how a Francis turbine works and to test its performance.



## PELTON TURBINE H19 HDMS

A compact experiment for use with the Hydraulic Bench (H1F) to demonstrate how a Pelton turbine works and to test its performance.



## HYDRAULIC RAM PUMP H31

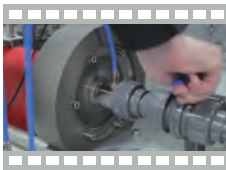
A compact experiment for use with the Hydraulic Bench (H1F) to demonstrate the use of water hammer to create a pumping action.



## CENTRIFUGAL PUMP TEST SET

H47 **VDAS**®

A self-contained, floor-standing mobile unit consisting of a water reservoir, pump, motor and Venturi meter for a comprehensive range of investigations into the performance and characteristics of a centrifugal pump. Demonstrates cavitation and the use of a Venturi tube.



## TWO-STAGE (SERIES AND PARALLEL) PUMPS H83 **VDAS**®

A self-contained, floor-standing mobile unit consisting of a water reservoir, two pumps and motors and a Venturi meter for a comprehensive range of investigations into the performance and characteristics of two centrifugal pumps in both series and parallel.

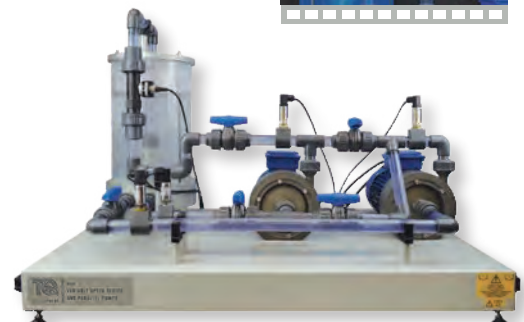
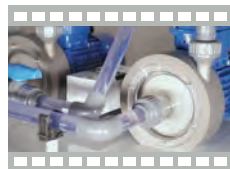


## SERIES AND PARALLEL PUMPS H52 / H53V **VDAS**® ONBOARD

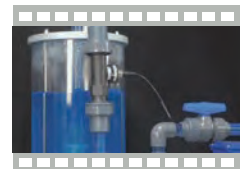
Two benchtop test sets that allow students to investigate the operation and performance of a single centrifugal pump and two centrifugal pumps configured in series or parallel. The H53V features a variable speed pump, speed, torque, power measurement and has VDAS® Onboard for automatic data acquisition.



SERIES AND PARALLEL PUMPS (H52)



VARIABLE SPEED SERIES AND PARALLEL PUMPS (H53V)










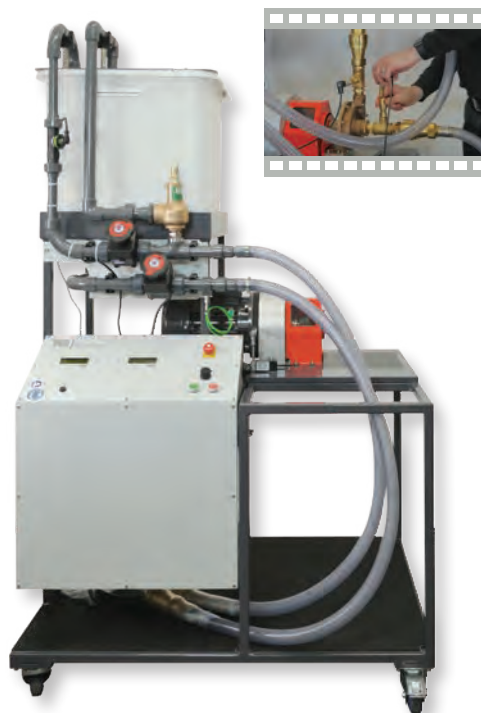
## MULTI-PUMP TEST SET H85V

A versatile, self-contained mobile unit designed to investigate and demonstrate the performance characteristics of a range of different pump types.



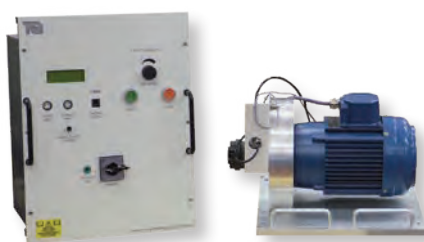
### EXPERIMENT MODULES:

-  Gear Pump (H85a)
-  Piston Pump (H85b)
-  Centrifugal pump (H85c)
-  Rotodynamic Axial Pump (H85d)
-  Vane Pump (H85e)
-  Lobe Pump (H85f)
-  Channel Impeller Pump (H85g)



## UNIVERSAL DYNAMOMETER MFP100

A dynamometer with sensors for measuring power, speed and torque. For use with the Modular Fluid Power range.



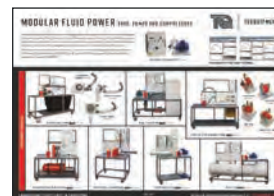
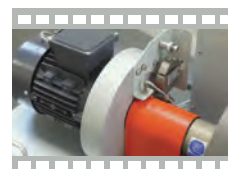
### EXPERIMENT MODULES:

- |  |    |
|--|----|
| Centrifugal Pump Module (MFP101)           | 27 |
| Axial Flow Pump Module (MFP102)            | 28 |
| Positive Displacement Pump Module (MFP103) | 28 |
| Reciprocating Compressor Module (MFP104)   | 28 |
| Centrifugal Compressor Module (MFP105)     | 29 |
| Centrifugal Fan Module (MFP106)            | 29 |
| Axial Fan Module (MFP107)                  | 29 |



ESSENTIAL BASE UNIT (MFP100)

EXPERIMENT MODULES (MFP101-MFP107)






EXPERIMENT MODULES POSTER

## CENTRIFUGAL PUMP MODULE MFP101

A self-contained, floor-standing mobile unit with full instrumentation for studying and performing tests on a centrifugal pump and optional turbines, to understand how they work and calculate performance.



### EXPERIMENT MODULES:

-  Pelton Wheel (Turbine) (MFP101b)
-  Propeller Turbine (MFP101c)
-  Francis Turbine (MFP101d)







## AXIAL FLOW PUMP MODULE

MFPI02 **VDAS**®





A self-contained, floor-standing mobile unit consisting of a water reservoir, pump, calibrated nozzle and valves. It allows students to study and perform tests on an axial flow pump, to understand how it works and calculate its performance.



## POSITIVE DISPLACEMENT PUMP MODULE MFPI03 **VDAS**®

A self-contained, floor-standing mobile unit with full instrumentation consisting of an oil reservoir, a positive displacement flow meter, valves and instruments to measure positive displacement pump performance.

### EXPERIMENT MODULES:

-  Piston Pump (MFP103a)
-  Gear Pump (MFP103b)
-  Vane Pump (MFP103c)
-  Swash Plate Pump (MFP103d)



## RECIPROCATING COMPRESSOR MODULE

MFPI04 **VDAS**®

A self-contained, floor-standing mobile unit that includes a small compressor with an air receiver and instrumentation. It allows students to study and perform tests on a reciprocating compressor, to understand how it works and calculate its performance.



## CENTRIFUGAL COMPRESSOR MODULE MFPI05 **VDAS**®

A self-contained, floor-standing mobile unit that includes a small compressor and instrumentation. It allows students to study and perform tests on a centrifugal compressor, to understand how it works and calculate its performance.



## CENTRIFUGAL FAN MODULE

MFPI06 **VDAS**®

A self-contained, floor-standing mobile unit that includes a fan and instrumentation to allow students to study and perform tests on a centrifugal fan, to understand how it works and calculate its performance.



## AXIAL FAN MODULE MFPI07 **VDAS**®

A self-contained, floor-standing mobile unit that includes an axial fan, duct and instrumentation. It allows students to study and perform tests on an axial fan, to understand how it works and calculate its performance.



## PRODUCT DEVELOPMENT

Products are continually being improved. For the latest up-to-date specification refer to the digital datasheets at **TECQUIPMENT.COM**



# MATERIALS TESTING AND PROPERTIES

BASIC ELASTIC PROPERTIES

STRESS AND STRAIN ANALYSIS

TORSION TESTING

FATIGUE TESTING

CREEP TESTING

TENSILE AND UNIVERSAL TESTING MACHINES

IMPACT TESTING

INDUSTRIAL HARDNESS TESTERS

TEST SPECIMENS

FREE-STANDING STRUCTURES EXPERIMENTS

## HOOKE'S LAW AND SPRING RATE **SM110** **DEFLEX**

Benchtop apparatus tests extension springs to find their properties. Proves Hooke's law and the basic rules of spring design.



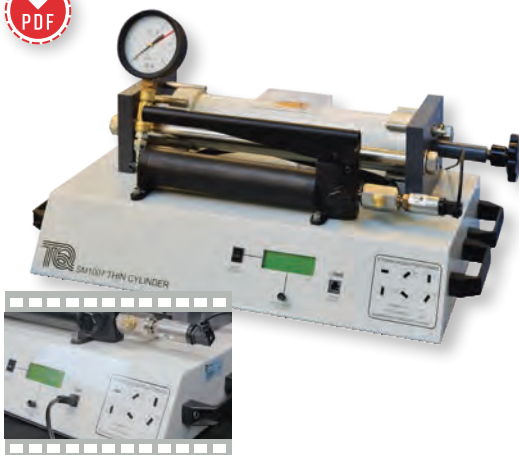
## STIFFNESS, BENDING AND TORSION **TE16** **DEFLEX**

Compact, benchtop apparatus enabling a variety of investigations into material stiffness including Young's modulus.



## THIN CYLINDER **SM1007** **VDAS**

Benchtop machine to allow students to perform stress and strain tests on a thin-walled cylinder. Introducing Mohr's circle and Poisson's ratio.



## DIAPHRAGM **SM1008** **VDAS**

Benchtop machine to allow students to perform stress, strain and deflection tests on a diaphragm.





## THICK CYLINDER SM1011 VDAS®

Benchtop machine to allow students to perform stress and strain tests on a thick-walled cylinder.



## DIGITAL STRAIN DISPLAY

SM1010 VDAS®

A 16-channel instrument that connects to industry-standard strain gauges to give direct readings of strain.



## STRAIN GAUGE KIT E19



Selection of resistance strain gauges and necessary accessories and consumable materials, for use with TecQuipment's SM1010 Digital Strain Display.



## STRAIN GAUGE TRAINER SM1009

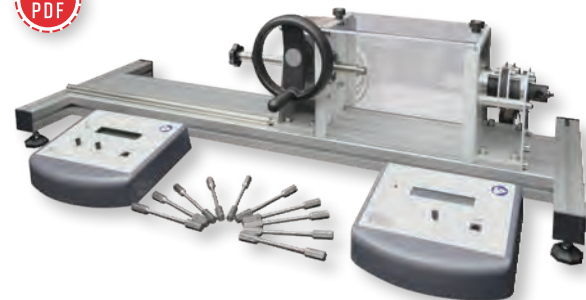
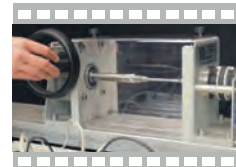
VDAS®

Benchtop bending system to test tension, torsion and bending to illustrate how resistance strain gauges work and methods of measuring strains in different structures. Can be used to demonstrate Young's modulus and Poisson's ratio.



## TORSION TESTING MACHINE, 30 NM SM1001 VDAS®

Benchtop machine to allow students to do torsion tests on different materials. Demonstrates Bauschinger effect.



## ROTATING FATIGUE MACHINE SM1090V VDAS®

A benchtop machine for demonstrating the failure of materials when subjected to an alternating stress, showing both low and high cycle fatigue.

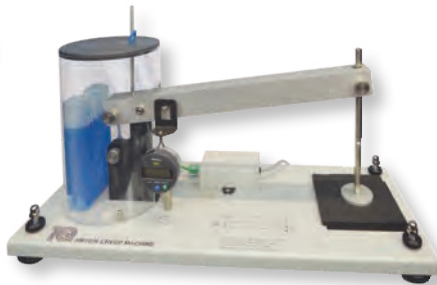




## CREEP MACHINE

SM1006 **VDAS**® **DEFLEX**

Benchtop machine which demonstrates the phenomenon of creep under different conditions and in different materials.



## BENCHTOP TENSILE TESTING MACHINE SM1002 **VDAS**® **DEFLEX**

A laboratory-scale, hand-driven benchtop tensile testing machine, 20 kN capacity.



## UNIVERSAL TESTING MACHINE SM1000 **VDAS**® **DEFLEX**

A versatile, bench-mounted machine for compressive and tensile tests on different materials and structures.



### EXPERIMENT MODULES:

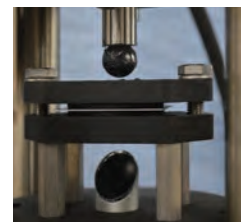
- Brinell Indenter (SM1000e)
- Coil Spring (SM1000f)
- Beam and Leaf Spring (SM1000g)
- Cupping Experiment (SM1000h)
- Double Shear Experiment (SM1000j)
- Disc Spring Experiment (SM1000k)



EXPERIMENT MODULES POSTER



UNIVERSAL TESTING MACHINE



CUPPING EXPERIMENT

## MATERIALS LABORATORY WITH DATA CAPTURE MF40 MKII **DEFLEX**

A versatile, benchtop machine for compressive and tensile tests on different materials and structures.



CUPPING, SPRING AND SHEAR EXPERIMENT



VIDEO CASE STUDY

## ENERGY ABSORBED AT FRACTURE TE15

Compact, benchtop apparatus for testing notched specimens. Forms an introduction to impact testing such as Izod and Charpy.



## ROCKWELL HARDNESS TESTER SM1015 MKII

A benchtop industrial-standard tester for accurate measurements of Rockwell hardness.



## VICKERS HARDNESS TESTER SM1016

A benchtop industrial-standard tester for accurate measurements of Vickers hardness.



## UNIVERSAL HARDNESS TESTER SM1017

A benchtop industrial-standard tester for accurate measurements of Vickers, Brinell and Rockwell hardness.



## UNSYMMETRICAL CANTILEVER APPARATUS SM1003 VDAS®

A benchtop test frame for examining and displaying bending of an unsymmetrical cantilever. Demonstrates the use of Mohr's circle.



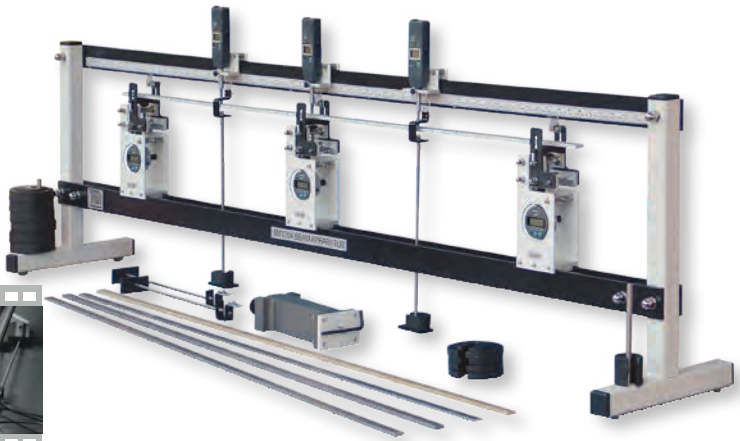




# BEAM APPARATUS

SM1004 **VDAS**® **DEFLEX**

A benchtop frame with load cells and cantilevers for the study of deflection and forces on different types of beams for a wide range of supports and loads. Also demonstrates Young's modulus. Set of additional beams and strain gauged beam available.



# EULER BUCKLING APPARATUS SM1005 **VDAS**®



Benchtop apparatus tests different types of struts and demonstrates how they deflect under load, and demonstrates the use of Southwell's method. Set of additional struts available.



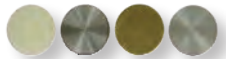
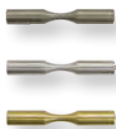
## COMPOSITE BEAM SETS FOR THE SM1004 AND SM1005

- Basic Composite Beam Set (SM1004d1 / SM1005b1)
- Cored Composite Beam Set (SM1004d2 / SM1005b2)
- Variable Stiffness Composite Beam Set (SM1004d3 / SM1005b3)



# TEST SPECIMENS

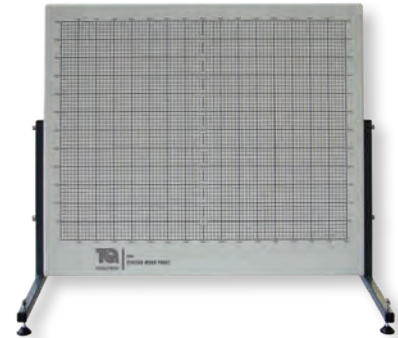
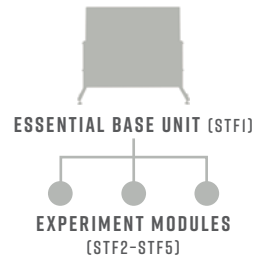
- Creep Test Specimens (CP)
- Rotating Fatigue Specimens (RF)
- Torsion Test Specimens (TR)
- Tensile Test Specimens (TH)
- Double Shear Test Specimens (DS)
- Cupping Test Specimens (ER)
- Tensile Test Specimens (TL and TS)
- Tensile Test Specimens (ML)
- Hardness Test Specimens (HTP)
- Hardness Reference Blocks (HTB)



## STATICS WORK PANEL

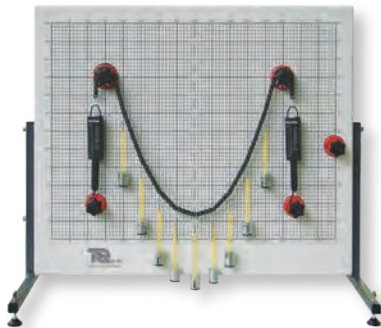
STF1

Work panel for use with TecQuipment's Statics Fundamentals (STF) range.



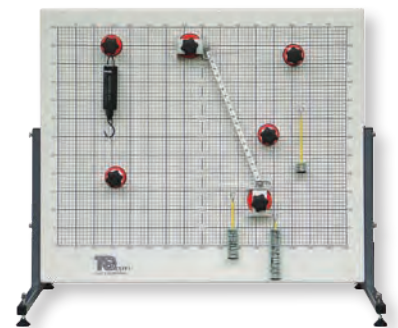
## SUSPENSION CABLE DEMONSTRATION STF2

A kit for use with the work panel that demonstrates the tensions and shapes in a suspension cable, comparing them with theory.



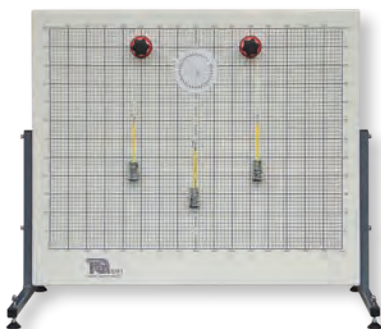
## EQUILIBRIUM OF A RIGID BODY STF3

A kit for use with the work panel that demonstrates the forces around a ladder-type structure.



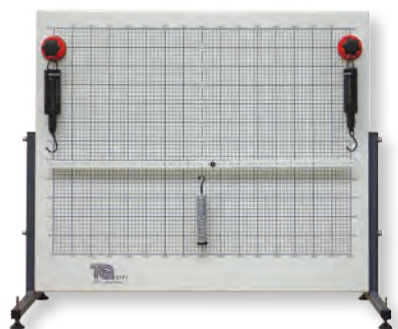
## EQUILIBRIUM OF FORCES STF4

A kit for use with the work panel for experiments with three or more coplanar forces at equilibrium and an introduction to Bow's notation.



## EQUILIBRIUM OF A BEAM STF5

A kit for use with the work panel for experiments with forces, moments and reactions around a beam at equilibrium.



# NEXT GENERATION STRUCTURES

## STRUCTURES PLATFORM

### ARCHES, BRIDGES AND TRUSSES

### FAILURE

### DEFLECTIONS AND STRESS

### MOMENTS

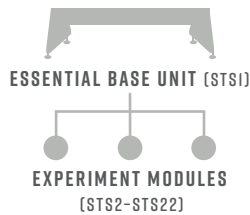
### TORSION

## STRUCTURES PLATFORM STS1

A benchtop platform that holds the experiments of the Structures range.



INTRODUCTION TO NEXT GENERATION STRUCTURES



SIMULATION CAPABILITIES OF THE STS RANGE USING VDAS® SOFTWARE



EXPERIMENT MODULES POSTER



SCREENSHOTS OF THE VDAS® SOFTWARE

### EXPERIMENT MODULES:

#### ARCHES, BRIDGES AND TRUSSES

- Pin Jointed Frameworks (STS8) 38
- Three-Pinned Arch (STS9) 38
- Two-Pinned Arch (STS10) 38
- Fixed Arch (STS11) 39
- Redundant Truss (STS17) 40
- Simple Suspension Bridge (STS19) 41
- Suspended Beam Bridge (STS21) 41

#### FAILURE

- Euler Buckling of a Column (STS12) 39
- Plastic Bending of Beams (STS15) 39
- Plastic Bending of Portals (STS16) 40

#### DEFLECTIONS AND STRESS

- Deflection of Beams and Cantilevers (STS4) 37
- Bending Stress in a Beam (STS5) 37
- Continuous and Indeterminate Beams (STS13) 39
- Curved Bars and Davits (STS14) 39
- Frame Deflections and Reactions (STS18) 40

#### MOMENTS

- Bending Moments in a Beam (STS2) 37
- Shear Force in a Beam (STS3) 37
- Bending Moments in a Portal Frame (STS20) 41
- Equilibrium of a Simply Supported Beam (STS22) 41

#### TORSION

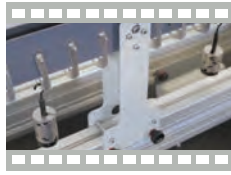
- Torsion of Circular Sections (STS6) 37
- Unsymmetrical Bending and Shear Centre (STS7) 38



## BENDING MOMENTS IN A BEAM STS2



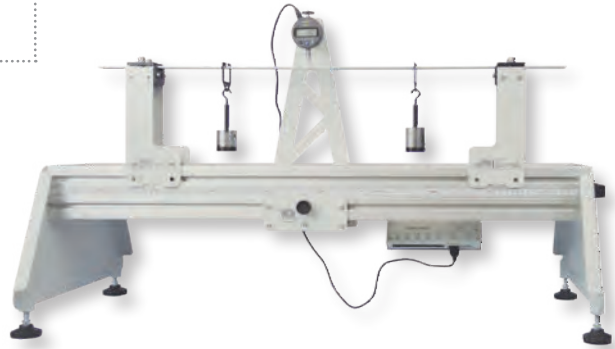
Experiment that illustrates and proves the basic theory of bending moments in a beam.



## SHEAR FORCE IN A BEAM STS3



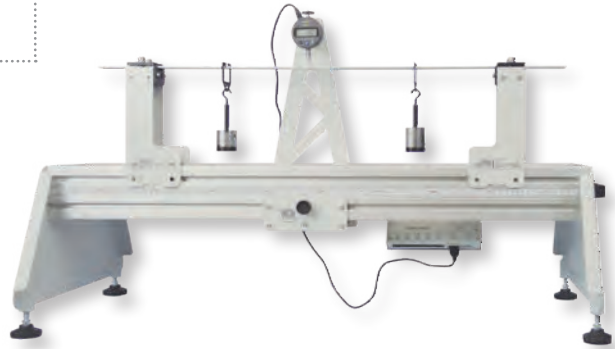
Experiment that illustrates and proves the basic theory of shear force in a beam.



## DEFLECTION OF BEAMS AND CANTILEVERS STS4



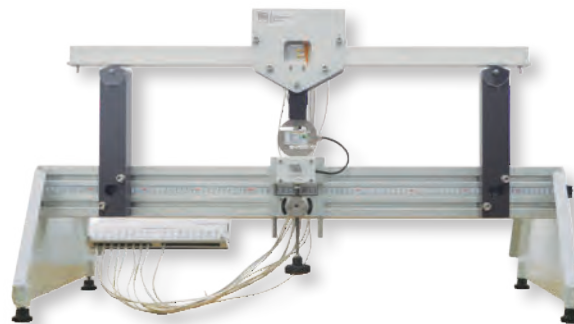
Experiment for the study of beam deflection under different loads and fixing conditions, and the demonstration of Young's modulus.



## BENDING STRESS IN A BEAM STS5



Experiment for the study of stress distribution across the section of a beam.



BENDING STRESS IN A BEAM EXPERIMENT



EXAMINING THE LOAD AND STRAIN GAUGE RELATIONSHIP

## TORSION OF CIRCULAR SECTIONS STS6

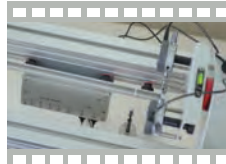


Experiment for the study of torque and deflection in different materials with circular section.



## UNSYMMETRICAL BENDING AND SHEAR CENTRE STS7

Experiment for the study of the vertical and horizontal deflection of different unsymmetrical sections.



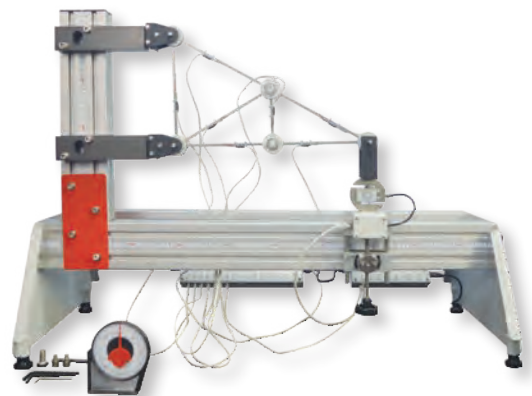
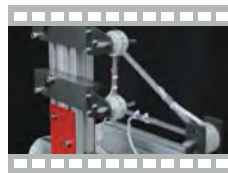
UNSYMMETRICAL BENDING AND SHEAR CENTRE



UNSYMMETRICAL BENDING AND SHEAR CENTRE EXPERIMENT

## PIN-JOINTED FRAMEWORKS STS8

Experiment for the study of strains, stresses, forces and deflections in various pin jointed frameworks, and the study of Bow's notation.



## THREE-PINNED ARCH STS9

Experiment for the study of the characteristics of a three-pinned arch under various load conditions.



## TWO-PINNED ARCH STS10

Experiment for the study of the characteristics of a two-pinned arch under various load conditions.



## FIXED ARCH STS11

Experiment for the study of the characteristics of a fixed arch under various load conditions.



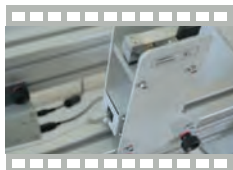
## EULER BUCKLING OF STRUTS STS12

Experiment for the study of buckling of struts and the relationships between length, end fixing conditions and buckling load.



## CONTINUOUS AND INDETERMINATE BEAMS STS13

Experiment that can be used to perform a wide variety of beam experiments, from simple cases to complex problems.



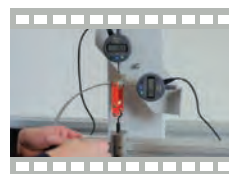
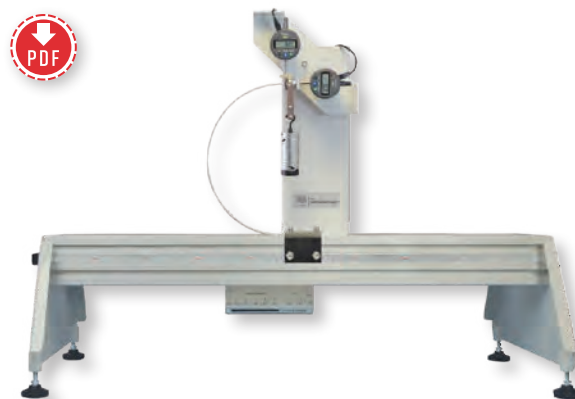
CONTINUOUS AND INDETERMINATE BEAMS EXPERIMENT



EXAMINING THE CENTRAL LOAD POINT

## CURVED BARS AND DAVITS STS14

Experiment for investigations into two common curved structures and two common davit structures.



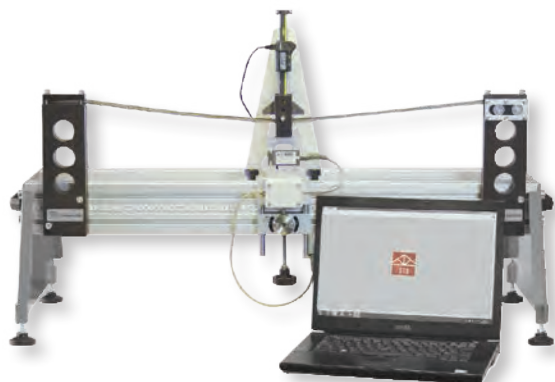
DEFLECTION OF CURVED BARS AND DAVITS



CURVED BARS AND DAVITS EXPERIMENT

## PLASTIC BENDING OF BEAMS STS15

Experiment for the study of plastic theory and limit state design of beams.





## PLASTIC BENDING OF PORTALS

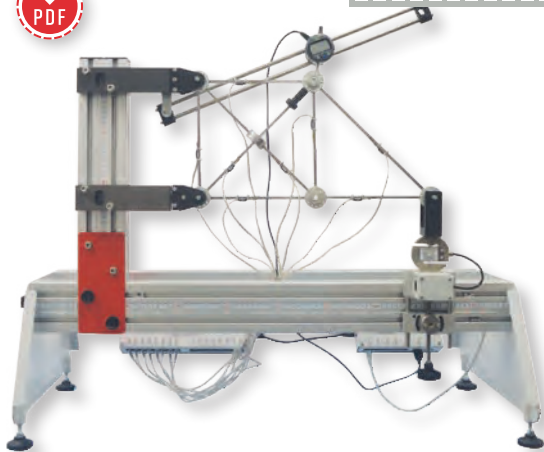
STS16 **VDAS** ONBOARD **DEFLEX**

Experiment for the study of plastic theory and limit state design in portal frames.



## REDUNDANT TRUSS STS17 **VDAS** ONBOARD

Experiment for the study of determinate and indeterminate truss structures.



## FRAME DEFLECTIONS AND REACTIONS STS18 **VDAS** ONBOARD **DEFLEX**

Experiment for the study of rectangular portals subjected to vertical loads.



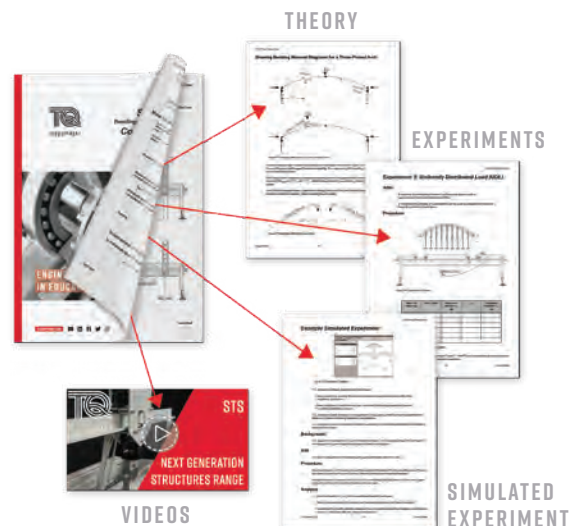
## DIGITAL STUDENT COURSE BOOKS

Enhancing students' learning and understanding of basic structural principles focusing on beams, bridges and cantilevers, these course books provide real-life examples and theories and run through the experimental set-up, procedures and analysis.

These free teaching materials include:

- Relevant theory
- Experiments with step-by-step instructions
- Simulated experiment
- Useful videos
- Easy to use on all platforms

[VISIT WEBSITE FOR MORE INFO](#)



## SIMPLE SUSPENSION BRIDGE

STS19 **VDAS**<sup>®</sup> **DEFLEX**

Experiment for the study of the characteristics of a simple suspension bridge.



NEW

# DEFLEX<sup>®</sup>

A digital image correlation (DIC) system, to enhance the student learning and research experience, for real-time and post-process measurement and visualisation of deformations, strains and displacements in materials and shapes.

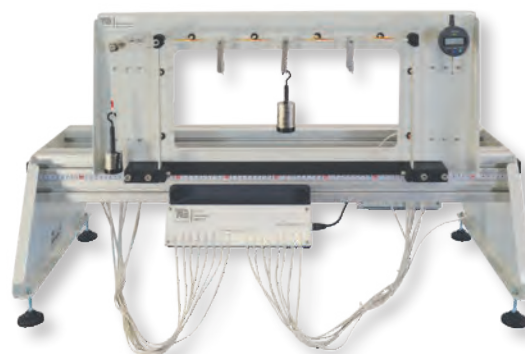
Go to [page 60](#) for more info.



## BENDING MOMENTS IN A PORTAL FRAME

STS20 **VDAS**<sup>®</sup>

Experiment for the study of bending moments and sway in portal frames.



## SUSPENDED BEAM BRIDGE

STS21 **VDAS**<sup>®</sup>

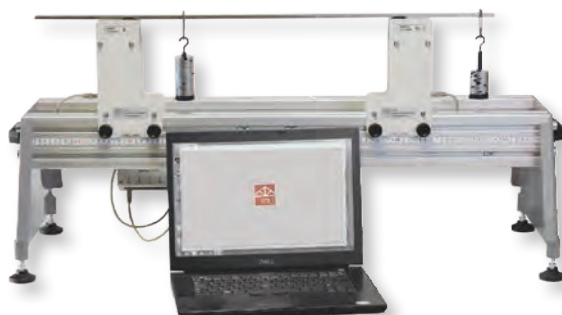
Experiment for the study of the characteristics of a suspended beam bridge.



## EQUILIBRIUM OF A SIMPLY SUPPORTED BEAM

STS22 **VDAS**<sup>®</sup>

Experiment for the study of the characteristics of a simply supported beam.





# THEORY OF MACHINES

FRICTION  
MOTION  
VIBRATION

## AIR BEARING APPARATUS TE96

**VDAS®**

Benchtop, self-contained air bearing apparatus to demonstrate the performance of self-acting, gas-lubricated journal bearings, including the phenomenon of half-speed whirl.



## HERTZIAN CONTACT APPARATUS TE98

Benchtop, self-contained unit that allows a practical examination of Hertz's theories of contact between materials.



## MICHELL PAD APPARATUS TE99

A benchtop, self-contained apparatus to demonstrate the pressure distribution across the film of oil in a Michell tilting pad slider bearing. Helps to prove Reynold's equation for pressure gradient in fluid film.

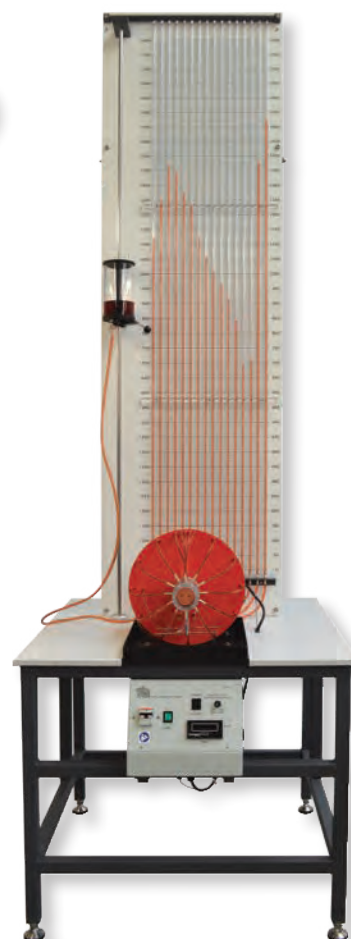






## JOURNAL BEARING DEMONSTRATION TM25

Floor-standing apparatus for demonstrating the pressures around a journal bearing at different speeds.



## CAM ANALYSIS MACHINE TM102IV



Benchtop apparatus and control and instrumentation unit, for studying the dynamic behaviour of different cams and followers and their 'bounce' speed.



## WHIRLING OF SHAFTS AND CRITICAL SPEED TM1001

Benchtop apparatus that demonstrates 'whirling' in different horizontal shafts with a variety of fixings (end conditions), loaded and unloaded.

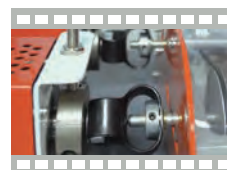


## GEARED SYSTEMS TM1018

Benchtop apparatus for dynamic and static experiments on geared and other drive systems. This base unit requires at least one of the optional drive units: toothed belt drive, round belt drive, chain drive and helical gear drive.

### EXPERIMENT MODULES:

- Toothed Belt Drive (TM1018b)
- Round Belt Drive (TM1018c)
- Chain Drive (TM1018d)
- Helical Gear Drive (TM1018e)





## BALANCE OF RECIPROCATING MASSES TM1022V



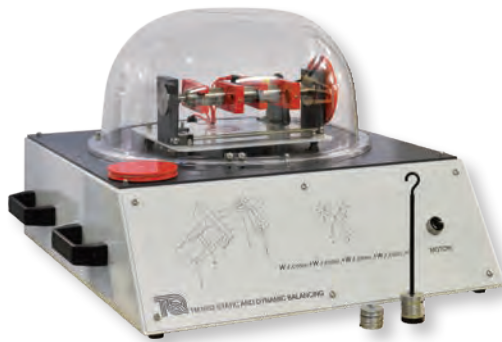
Bench-mounted model four-cylinder engine with control and instrumentation unit that demonstrates the primary and secondary forces and moments when balancing reciprocating masses.



## STATIC AND DYNAMIC BALANCING TM1002

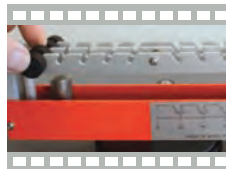
TM1002

Benchtop apparatus for experiments in balancing a rotating mass system, statically and dynamically.



## CENTRIFUGAL FORCE TM1005 VDAS®

Benchtop apparatus for experiments in centrifugal force and angular velocity.



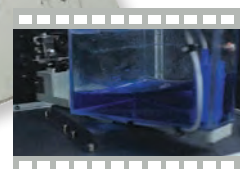
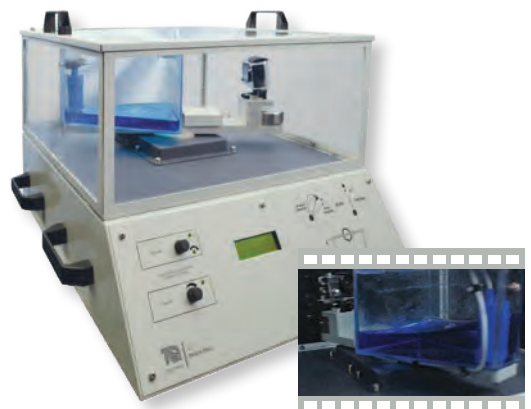
## GYROSCOPE TM1004 VDAS®

Benchtop apparatus for experiments in gyroscopic couple and velocities of rotor and precision.



## CORIOLIS FORCE TM1017

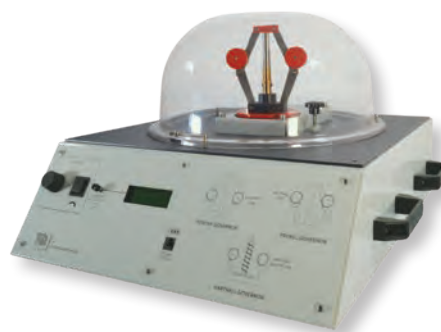
Benchtop apparatus for demonstrations and experiments in Coriolis force.





## GOVERNORS TM1027

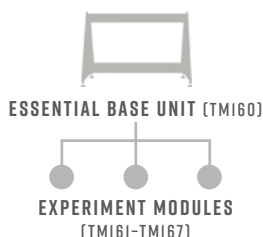
Benchtop apparatus for demonstrating how different governors work, including Hartnell, Porter and Proell governors.



## FREE VIBRATIONS TEST FRAME

TM160

A sturdy benchtop frame for use with the Free Vibrations experiment modules.



### EXPERIMENT MODULES:



Simple and Compound Pendulums (TM161)



Filar Pendulums (TM162)



Centre of Percussion (TM163)



Free Vibrations of a Mass Spring System (TM164) **VDAS**® **DEFLEX**



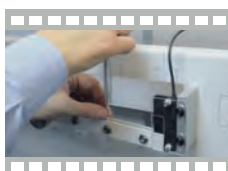
Free Torsional Vibrations (TM165) **VDAS**® **DEFLEX**



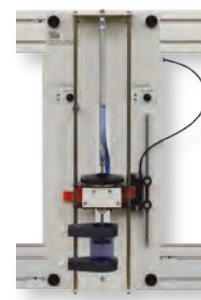
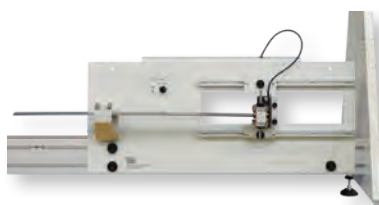
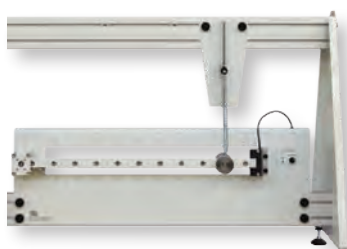
Free Vibrations of a Cantilever (TM166) **VDAS**® **DEFLEX**



Free Vibrations of a Beam and Spring (TM167) **VDAS**® **DEFLEX**



EXPERIMENT MODULES POSTER



## FREE AND FORCED VIBRATIONS

TM1016V **VDAS**® **DEFLEX**

Investigates the free and forced vibrations of a rigid beam with a spring, and a simply supported beam. Demonstrates Rayleigh's approximation and Dunkerley's method.







# THERMODYNAMICS

THERMODYNAMIC PRINCIPLES

HEAT TRANSFER

TEMPERATURE

COMPRESSORS

STEAM



## IDEAL GASES - BOYLE'S LAW

TD1000 **VDAS**®

Benchtop apparatus that demonstrates the relationship between pressure and volume of an ideal gas at a fixed temperature.



## IDEAL GASES - GAY-LUSSAC'S LAW

TD1001 **VDAS**®

Benchtop apparatus that demonstrates the relationship between pressure and temperature of a fixed volume of ideal gas.



## EXPANSION OF A PERFECT GAS

TD1004V **VDAS**®  
ONBOARD

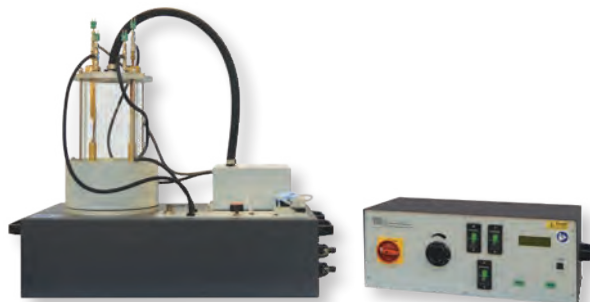
Benchtop apparatus to demonstrate the behaviour and expansion processes of a perfect gas.



# FILMWISE AND DROPWISE CONDENSATION AND BOILING

TE78 **VDAS**®

Benchtop apparatus with control and instrumentation unit that demonstrates heat transfer during different boiling and condensing processes.



## EMISSIVITY - NATURAL CONVECTION AND RADIATION **TD1011V** **VDAS**® ONBOARD

Trolley-mounted, mobile apparatus that demonstrates how different types of heat can transfer over a range of pressures; helps the understanding of the Stefan Boltzman constant.



## UNSTEADY STATE HEAT TRANSFER **TD1009V** **VDAS**® ONBOARD

Benchtop apparatus that measures unsteady state heat transfer to bodies of different shape and thermal conductivity.



## FORCED CONVECTION HEAT TRANSFER **TDI**

Trolley-mounted, mobile apparatus that demonstrates forced convection in pipes and heat transfer theory. Illustrates the derivation of the value of Nusselt number, determination of the Stanton number and determination of the validity of the Reynolds analogy for air.



## HEAT TRANSFER EXPERIMENTS BASE UNIT TD1002 **VDAS**<sup>®</sup>

A benchtop base unit for demonstrating different methods of heat transfer. Requires at least one of the four optional experiments.



### EXPERIMENT MODULES:



Linear Heat Conduction Experiment (TD1002a)



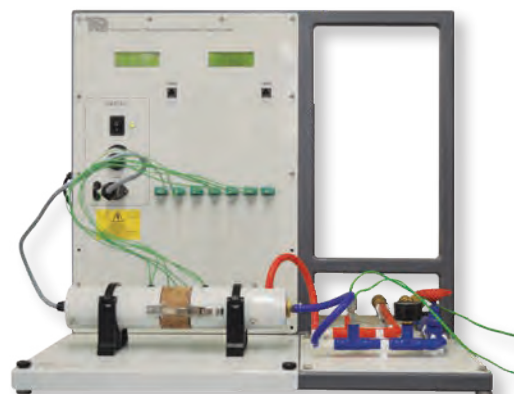
Radial Heat Conduction Experiment (TD1002b)



Extended Surface Heat Transfer Experiment (TD1002c)



Conductivity of Liquids and Gases Experiment (TD1002d)



BASE UNIT FITTED WITH THE LINEAR HEAT CONDUCTION EXPERIMENT

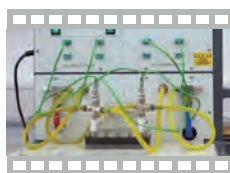
## FREE AND FORCED CONVECTION TD1005 **VDAS**<sup>®</sup>

Benchtop apparatus that illustrates free and forced convection from different transfer surfaces.

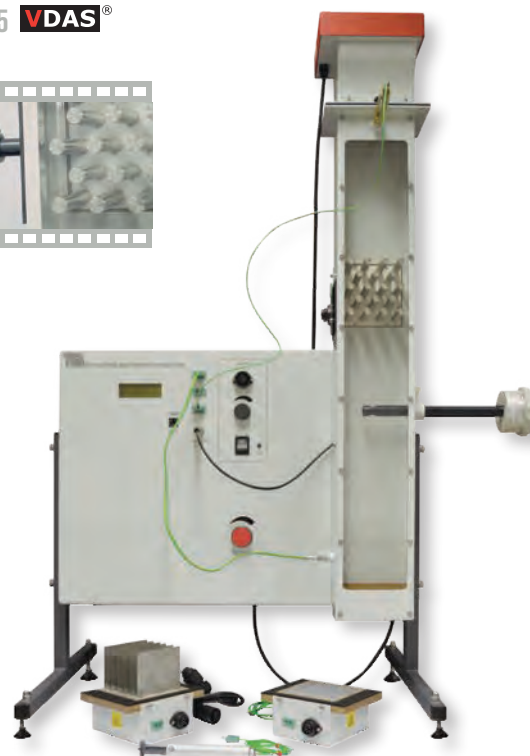


## HEAT EXCHANGER SERVICE MODULE TD1360V **VDAS**<sup>®</sup>

A benchtop base unit for examining and comparing small-scale heat exchangers to help students understand how they work. Requires at least one of the five associated experiments.



SERVICE MODULE FITTED WITH THE CONCENTRIC TUBE HEAT EXCHANGER EXPERIMENT (TD1360A)



### EXPERIMENT MODULES:



Concentric Tube Heat Exchanger (TD1360a)



Plate Heat Exchanger (TD1360b)



Shell and Tube Heat Exchanger (TD1360c)



Jacketed Vessel with Coil and Stirrer (TD1360d)



Cross-Flow Water-To-Air Heat Exchanger (TD1360e)



## PELTIER AND SEEBECK EFFECT

TDI008 **VDAS**®

Benchtop apparatus that examines the performance of a thermoelectric device when connected for Peltier heat pump or Seebeck exchanger.



## CROSS-FLOW HEAT EXCHANGER

TE93 **VDAS**®

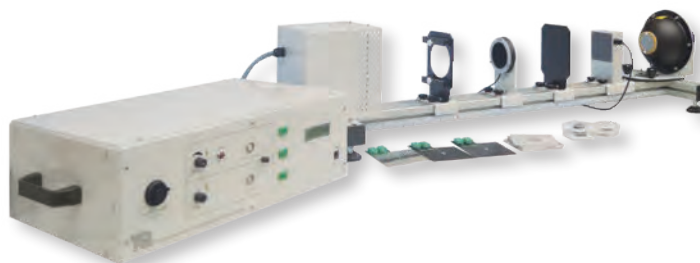
Benchtop apparatus with a control and instrument unit for studies into the principles and performance of heat exchangers.



## RADIANT TRANSFER EXPERIMENTS

TDI003 **VDAS**®

Benchtop apparatus with a control box that demonstrates the laws of radiant transfer from heat and light sources.



## WATER-TO-AIR HEAT EXCHANGERS

TDI007 **VDAS**®

Benchtop apparatus that illustrates how cross-flow water-to-air heat exchangers work. Includes a 32-tube heat exchanger. Also available separately are 16-tube and finned heat exchangers.



16-TUBE HEAT EXCHANGER



16-TUBE FINNED HEAT EXCHANGER

# TEMPERATURE MEASUREMENT AND CALIBRATION TD400 **VDAS**<sup>®</sup>

Benchtop apparatus that studies the accuracy, linearity and important characteristics of popular temperature measuring devices.



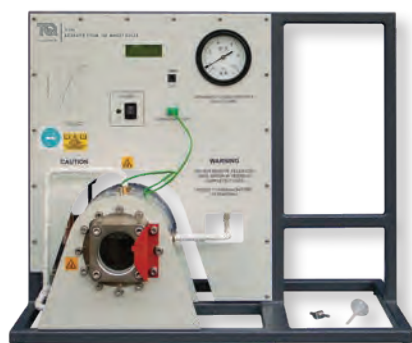
## BOMB CALORIMETER TD500

For the accurate determination of the calorific value of liquid and solid hydrocarbons.



## TWO-STAGE COMPRESSOR TEST SET GT103

Trolley-mounted, mobile apparatus that illustrates how single and two-stage compressors work, and their thermodynamic properties.



## SATURATED STEAM - THE MARCET BOILER TD1006 **VDAS**<sup>®</sup>

Benchtop apparatus that illustrates the pressure and temperature relationship for saturated steam.



NEW

## THERMAL POWER PLANT WITH STREAM TURBINE **VDAS<sup>®</sup> ONBOARD** TD1060V

Mobile laboratory-scale steam turbine that demonstrates fundamental thermodynamic principles of energy conversion and mechanical power measurement.



## THERMAL POWER PLANT WITH STEAM ENGINE TRAINER **TD1050 VDAS<sup>®</sup>**

Trolley-mounted, mobile, laboratory-scale steam plant that demonstrates fundamental thermodynamic principles of energy conversion and mechanical power measurement.

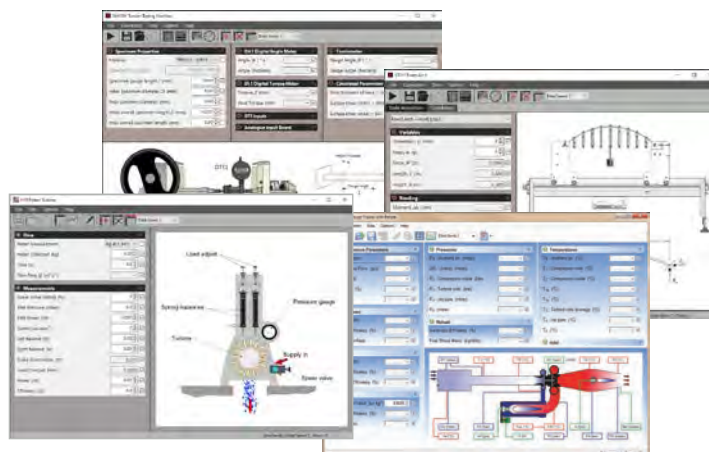


## SOFTWARE DOWNLOADS

TecQuipment develops in-house software to support and further enhance the experimental capabilities of our equipment:

- VDAS<sup>®</sup>
- HDMS
- LabVIEW
- Gas Turbines
- CE2000 Control

[TECQUIPMENT.COM/DOWNLOADS](http://TECQUIPMENT.COM/DOWNLOADS)







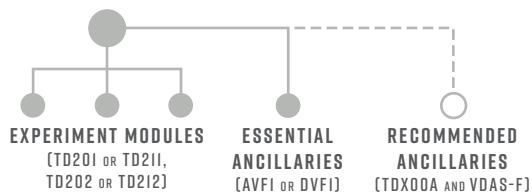
# ENGINES

INTERNAL COMBUSTION ENGINE TEST SETS  
GAS TURBINES





## SMALL ENGINE TEST SET TD200 **VDAS**<sup>®</sup>

Trolley-mounted, mobile engine test bed with benchtop instrumentation for investigations into the fundamental features of internal combustion engines. Requires at least one of the eight available engines, available in pull or electric start (ES).

### ESSENTIAL BASE UNIT (TD200)



### EXPERIMENT MODULES:

-  Four-Stroke Petrol Engine (TD201)\*
-  Four-Stroke Diesel Engine (TD202)\*
-  Modified Four-Stroke Petrol Engine (TD211)\*
-  Modified Four-Stroke Diesel Engine (TD212)\*

\* Available with electric start



## AUTOMATIC VOLUMETRIC FUEL GAUGE **DVFI** **VDAS**<sup>®</sup>

Frame-mounted automatic fuel gauge with digital display, for use with TecQuipment's Engine Test Sets (TD200 and TD300).



## MANUAL VOLUMETRIC FUEL GAUGE **AVFI**

Frame-mounted manual fuel gauge for use with TecQuipment's Engine Test Sets (TD200 and TD300).



## REGENERATIVE ENGINE TEST SET TD300 **VDAS**®

This floor-mounted engine test set, with bench and instrumentation frame, offers the most advanced student investigations into engine performance from TecQuipment. The four-quadrant drive absorbs more power, higher levels of accuracy, has improved speed stability and settles quicker, saving time in the laboratory. Includes extensive instrumentation for comprehensive investigations.



### EXPERIMENT MODULES:

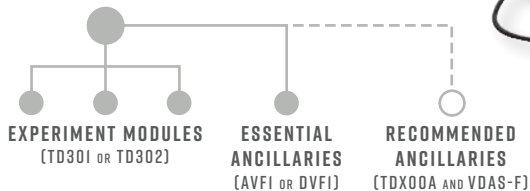


Four-Stroke Petrol Engine (TD301)



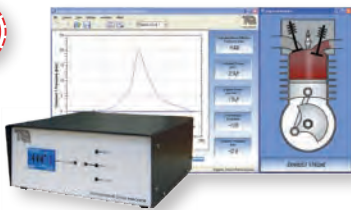
Four-Stroke Diesel Engine (TD302)

### ESSENTIAL BASE UNIT (TD300)



## ENGINE CYCLE ANALYSER **ECA100**

Hardware and software to measure internal combustion engine cylinder pressure and crank angle.



## EXHAUST GAS CALORIMETER

**TDX00A** **VDAS**®

Experiment for use with TecQuipment's Engine Test Sets (TD200 and TD300) to measure the heat content of engine exhaust gases.



## TRAINING AVAILABLE ON-SITE OR AT TECQUIPMENT HEADQUARTERS

Comprehensive equipment training is available from TecQuipment's team of specialist engineers.

Topics include:

- Operation
- Safety
- Maintenance
- Introductory experimentation







## TWO-SHAFT GAS TURBINE

**GT185** ADA

Trolley-mounted, mobile apparatus that allows detailed experiments on how a two-shaft gas turbine works, and tests its performance.



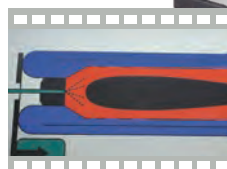
## TURBOJET TRAINER GT100 ADA

Trolley-mounted, mobile apparatus that allows detailed experiments on how a single-shaft gas turbojet works, and tests its performance.



## TURBOJET TRAINER WITH REHEAT GT100RS ADA

Trolley-mounted, mobile apparatus that allows detailed experiments on how a single-shaft gas turbojet with reheat (afterburner) works, and tests its performance.





# ENVIRONMENTAL CONTROL

COOLING  
HUMIDITY  
REFRIGERATION  
AIR CONDITIONING  
HVAC & R



ENVIRONMENTAL CONTROL

## COOLING TOWERS EC1000V

Benchtop apparatus that demonstrates the operation characteristics of an evaporative cooling tower.

### AVAILABLE COLUMNS:

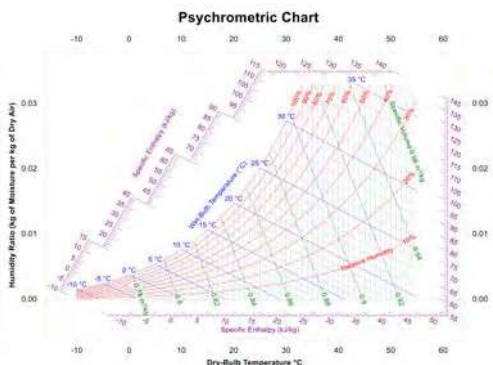
- Cooling Column Type A (EC1000a)
- Cooling Column Type B (EC1000b)
- Empty Cooling Column (EC1000c)
- Packing Characteristics Column (EC1000d)



## DOWNLOADS

A pressure-enthalpy diagram and psychrometric chart for use with EC1000V, EC1501V and EC1550V can be downloaded at:

[TECEQUIPMENT.COM/DOWNLOADS](http://TECEQUIPMENT.COM/DOWNLOADS)



## HUMIDITY MEASUREMENT TE6

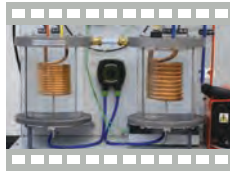
Benchtop apparatus that illustrates the principles of humidity measurement and compares various methods of measurement.



## REFRIGERATION CYCLE

ECI500V 

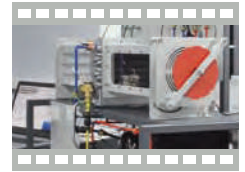
Benchtop apparatus that allows students to investigate and observe the stages of refrigeration, such as the coefficient of performance, superheat and subcooling.



## AIR CONDITIONING TRAINER

ECI501V 

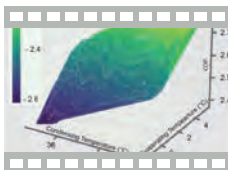
Benchtop apparatus that allows students to investigate the fundamental principles of air conditioning, including enthalpy change in the air flow.



## ADVANCED HVAC & R TRAINER ECI550V



A versatile floor-standing apparatus for the in-depth study of heating, ventilation, air conditioning and refrigeration (HVAC & R) systems. Facilitates the analysis of individual and combined psychrometric processes commonly used in air conditioning. Also allows study of the vapour compression refrigeration cycle, including the use of pressure enthalpy (P-h) charts.



BASE UNIT (ECI550V) FITTED WITH THE OPTIONAL RECIRCULATION DUCT AND ENVIRONMENTAL CHAMBER

# ALTERNATIVE ENERGY

HYDRO

WIND

SOLAR PHOTOVOLTAIC

SOLAR THERMAL



ALTERNATIVE ENERGY

NEW

## HYDRO-ELECTRIC TURBINE

AE1000V **VDAS**  
ONBOARD

The TecQuipment Hydro-Electric Turbine is a versatile, floor-standing, self-contained apparatus for demonstration of hydro-electricity. It is supplied with five different propellers. The product focuses on exploring the best efficiency point of different propellers and perform energy audits to analyse system performance.



## WIND TURBINE DYNAMICS

AE1005V **VDAS**  
ONBOARD

This is a versatile, compact apparatus for teaching the fundamentals of kinetic wind energy conversion into electrical power. Flexibility is at the core, it has a castor-mounted frame for mobility and functionality and allows students to 3D-print their own blades for advanced experimentation.







## PHOTOVOLTAIC CELLS TE4 VDAS®

Floor-standing mobile apparatus with instrumentation, includes high and low-capacity batteries. It illustrates how effective photovoltaic cells are in capturing solar energy.



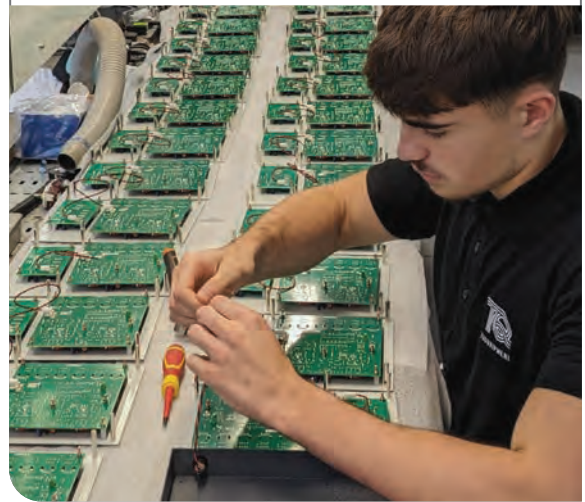
### SOLAR LIGHT BANK TE4A

Floor-standing apparatus with 15 tungsten halogen lamps consuming up to 6 kW of power.



## QUALITY CONTROL WITH IN-HOUSE PRODUCTION

To maintain high quality and keep lead times to a minimum, products are designed and manufactured all under one roof at the TecQuipment headquarters based in the UK.



## FOCUSING SOLAR ENERGY COLLECTOR

TE38 VDAS®

Floor-standing mobile apparatus that illustrates the workings of a focusing solar energy collector and allows students to study its performance. Supplied with four sizes of absorber.



## FLAT PLATE SOLAR THERMAL ENERGY COLLECTOR TE39 VDAS®

Floor-standing, folding mobile apparatus with instrumentation that illustrates the workings of a flat plate solar energy collector and allows students to study its performance.



# VERSATILE DATA ACQUISITION SYSTEM



VERSATILE DATA ACQUISITION SYSTEM

## VERSATILE DATA ACQUISITION SYSTEM (VDAS®)

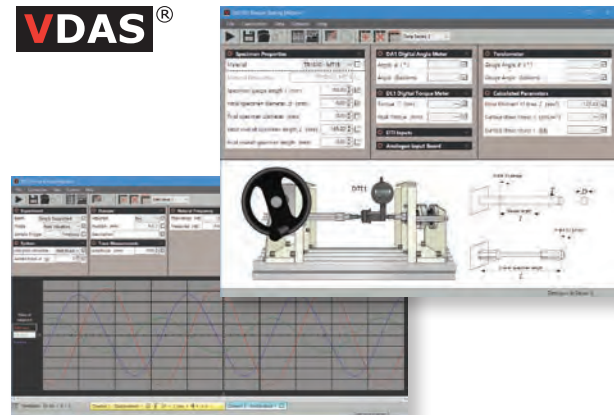
VDAS® is a high capacity, accurate, efficient and user-friendly automatic data acquisition hardware and software package that works with a growing list of over 90 TecQuipment products, enabling real-time display and capture of experiment data.



VDAS® FAMILIARISATION



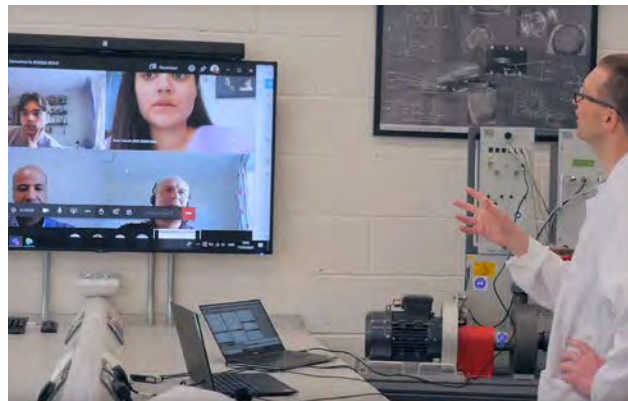
**VDAS®**



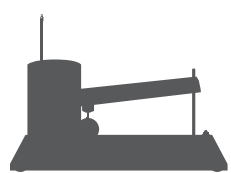
## A REMOTE WORKING SOLUTION: VDAS® e-lab

**VDAS®**  
**e-lab**

VDAS® e-lab is software that works with TecQuipment's VDAS®-enabled products that can be used remotely, allowing students to interactively engage and participate in laboratory experiments for an adaptable, blended learning approach.



Live experimental data direct from the laboratory can be processed by an unlimited number of remote students.



VDAS®-COMPATIBLE  
TECQUIPMENT PRODUCT

OUTPUT  
SIGNALS

**VDAS®**

VDAS® HARDWARE/  
VDAS® ONBOARD

DATA



LIVE DATA  
FEED

**e-lab**



REMOTE WORKING STUDENTS

LABORATORY



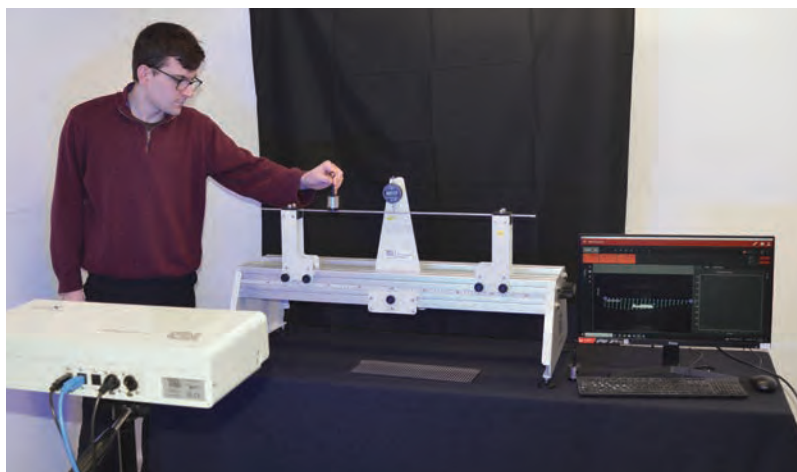
# OPTICAL EXTENSOMETRY

## DEFLEX®

A digital image correlation (DIC) system designed to enhance the student learning experience for real-time and post-process non-contact measurement and visualisation of deformation, strains and displacements in materials, shapes and structures. Complements the teaching equipment.



DEFLEX®-EDU



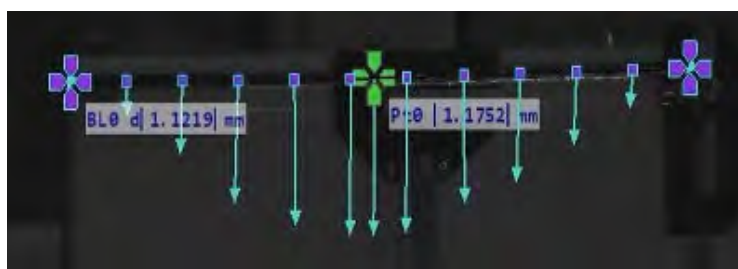
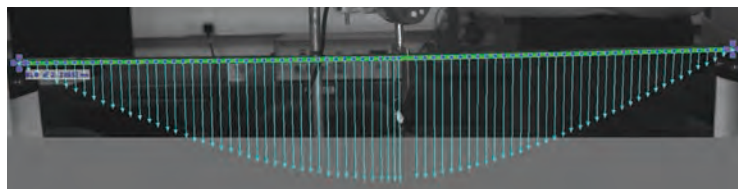
Deflex® is a contactless digital technique to help students learn how to measure and analyse deformations of objects optically. It is equipped with camera measurement and image processing software for analyzing motions, displacements and strains. It can measure visible features on objects and material surfaces like screws, joints, edges, grooves and composite structures.

The system uses Deflex® software which can be licensed for educational use (Deflex®-Edu), or for grant-funded research purposes up to TRL5 (Deflex®-Pro).



DEFLEX® POSTER

The Deflex® camera can measure objects at different distances using a range of suitable and interchangeable lenses.





## GENERAL-PURPOSE ANCILLARIES AND INSTRUMENTS

The following items are ancillaries to some of the products and product ranges in this catalogue. Some will only work with TecQuipment products, while others will also work as general-purpose laboratory equipment.

### OSCILLOSCOPES

#### DUAL BEAM STORAGE OSCILLOSCOPE H405A\*

A two-channel 50 MHz digital storage oscilloscope. Works with several TecQuipment products and is good for general-purpose use.

#### OSCILLOSCOPE OSI\*

A dual-channel 50 MHz digital oscilloscope. Works with several TecQuipment products and is good for general-purpose use.

### PRESSURE INSTRUMENTS

#### COMPRESSOR CE1B\*

Air compressor and reservoir to provide air for the CE107 Engine Speed Control Apparatus.

### STROBOSCOPES AND TACHOMETERS

#### STROBOSCOPE STI

A portable digital stroboscope for general laboratory use, such as speed measurement and motion studies.

Works with several TecQuipment products.



#### OPTICAL TACHOMETER OTI\*

A hand-held, battery-powered optical tachometer with a digital display and a speed range of 3 to 99999 rev.min<sup>-1</sup> (rpm). It works with reflective surfaces or stick-on reflective tape.

Works with several TecQuipment products and is good for general-purpose use.

### BENCHES

#### WORK BENCH WBI

TecQuipment's sturdy work bench is suitable for use with most benchtop products.



\* Please contact TecQuipment or the local distributor for the latest specification.

## HERE TO HELP YOU

A team of specialist customer care personnel are available to answer a range of question relating to technical details, spare parts and maintenance:

**CUSTOMER.CARE@TECQUIPMENT.COM**



## PRODUCT LIST

This is a list of our main line items so some ancillary products may not appear. Please refer to the main line item to find any ancillaries (for example, to find H40a look at H40). Alternatively, check our website at [TECEQUIPMENT.COM](http://TECEQUIPMENT.COM) or contact our expert Sales team.

### A

<b>AE1000V</b>	Hydro-Electric Turbine	57
<b>AE1005V</b>	Wind Turbine Dynamics	57
<b>AF10</b>	Modular Air Flow Bench	8
<b>AF11</b>	Bernoulli's Equation	8
<b>AF12</b>	Drag Force	8
<b>AF13</b>	Round Turbulent Jet	9
<b>AF14</b>	Boundary Layer	9
<b>AF15</b>	Flow Around a Bend	9
<b>AF16</b>	Coandă Effect and Jet Flow	9
<b>AF17</b>	Flow Visualisation	9
<b>AF18</b>	Tapped Aerofoil	9
<b>AF27</b>	Laval Nozzle Flow Apparatus	9
<b>AF41V</b>	Flight Demonstration Wind Tunnel	12
<b>AF80</b>	Flow Visualisation Wind Tunnel	9
<b>AF300</b>	Intermittent Supersonic Wind Tunnel	12
<b>AF300A / AF302A</b>	Schlieren Apparatus	12
<b>AF302</b>	Continuous Supersonic Wind Tunnel	12
<b>AF1125</b>	Benchtop Subsonic Wind Tunnel	11
<b>AF1300</b>	Subsonic Wind Tunnel	10
<b>AF1450S</b>	Subsonic Wind Tunnel	11
<b>AF1600S</b>	Subsonic Wind Tunnel	11
<b>AVFI</b>	Manual Volumetric Fuel Gauge	52

### C

<b>CE103</b>	Thermal Control Process Apparatus	13
<b>CE105/MV</b>	Coupled Tanks Apparatus	14
<b>CE106</b>	Ball and Beam Apparatus	13
<b>CE107</b>	Engine Speed Control Apparatus	14
<b>CE108</b>	Coupled Drives Apparatus	14
<b>CE109</b>	Ball and Hoop Apparatus	14
<b>CE110</b>	Servo Trainer	14
<b>CE111</b>	PLC Process	15
<b>CE117</b>	Process Trainer	15
<b>CE120</b>	Controller	13
<b>CE122</b>	Digital Interface	13
<b>CE123</b>	PLC Trainer	15
<b>CE1B</b>	Compressor	61
<b>CE2000</b>	Control Software	13

### D

<b>DEFLEX®</b>	DefleX®	60
<b>DVFI</b>	Automatic Volumetric Fuel Gauge	52

### E

<b>E19</b>	Strain Gauge Kit	31
<b>EC1000V</b>	Cooling Towers	55
<b>EC1500V</b>	Refrigeration Cycle	56
<b>EC1501V</b>	Air Conditioning Trainer	56
<b>EC1550V</b>	Advanced HVAC & R Trainer	56
<b>ECA100</b>	Engine Cycle Analyser	53
<b>ES1</b>	Work Panel	3
<b>ES2</b>	Forces Kit	4
<b>ES3</b>	Moments Kit	4
<b>ES4</b>	Deflection of Beams and Cantilevers Kit	5
<b>ES5</b>	Torsion of Circular Sections Kit	5
<b>ES6</b>	Tensile Tester Kit	5
<b>ES7</b>	Simple Harmonic Motion Kit	5
<b>ES8</b>	Friction and Inclined Plane Kit	5
<b>ES9</b>	Potential and Kinetic Energy Kit	6
<b>ES10</b>	Pulley Kit	6
<b>ES11</b>	Drive System Kit	6
<b>ES12</b>	Cam, Crank and Toggle Kit	6

<b>ES13</b>	Gear Trains Kit	6
<b>ES14</b>	Simple Mechanisms Kit	7
<b>ES15</b>	Bar Linkages Kit	7
<b>ES16</b>	Centrifugal Force Kit	7
<b>ES17</b>	Rotational Friction Kit	7
<b>ES18</b>	Additional Mechanisms Kit	7
<b>ES19</b>	Spring Tester Kit	7
<b>ESF</b>	Engineering Science Full Set	3
<b>ESSW</b>	Smart Worksheets	4

### F

<b>FC15</b>	Flow Visualisation	18
<b>FC50</b>	2.5-Metre Flume	22
<b>FC80</b>	Flow and Sediment Transport Channels	22
<b>FC300</b>	Flumes	23

### G

<b>GT100</b>	Turbojet Trainer	54
<b>GT100RS</b>	Turbojet Trainer with Reheat	54
<b>GT103</b>	Two-Stage Compressor Test Set	50
<b>GT185</b>	Two-Shaft Gas Turbine	54

### H

<b>H1F</b>	Digital Hydraulic Bench	17
<b>H2 MKII</b>	Metacentric Height and Stability	23
<b>H3A</b>	Calibration of a Bourdon Pressure Gauge	19
<b>H4</b>	Flow Through an Orifice	20
<b>H5</b>	Bernoulli's Theorem	18
<b>H6</b>	Discharge over a Notch	18
<b>H7</b>	Friction Loss in a Pipe	19
<b>H8</b>	Impact of a Jet	20
<b>H9</b>	Hele-Shaw Apparatus	20
<b>H10</b>	Flow Measurement Methods	18
<b>H11</b>	Centre of Pressure	24
<b>H13</b>	Vortex Apparatus	21
<b>H16</b>	Losses in Piping Systems	19
<b>H18</b>	Francis Turbine	25
<b>H19</b>	Pelton Turbine	25
<b>H30</b>	Pressure Measurement Bench	18
<b>H31</b>	Hydraulic Ram Pump	25
<b>H33</b>	Jet Trajectory and Orifice Flow	21
<b>H34</b>	Pipework Energy Losses	19
<b>H40</b>	Flow Meter Calibration	19
<b>H47</b>	Centrifugal Pump Test Set	26
<b>H52</b>	Series and Parallel Pumps	26
<b>H53V</b>	Variable Speed Series and Parallel Pumps	26
<b>H83</b>	Two-Stage (Series and Parallel) Pumps	26
<b>H85V</b>	Multi-Pump Test Set	27
<b>H215</b>	Osborne Reynolds Apparatus	20
<b>H311</b>	Liquid Sedimentation Apparatus	24
<b>H312</b>	Permeability, Flow Nets and Darcy's Law	24
<b>H313</b>	Hydrology and Rainfall Apparatus	25
<b>H313V</b>	Advanced Hydrology and Rainfall Apparatus	25
<b>H314</b>	Hydrostatics and Properties of Fluids	24
<b>H400</b>	Cavitation in a Venturi	21
<b>H405</b>	Pipe Surge and Water Hammer	21
<b>H405A</b>	Dual Beam Storage Oscilloscope	61
<b>H408</b>	Fluid Friction Apparatus	20
<b>H410</b>	Viscosity and Particle Drag	24
<b>HDMS</b>	HDMS Software	17

### M

<b>MF40 MKII</b>	Materials Laboratory with Data Capture	32
<b>MFPI00</b>	Universal Dynamometer	27
<b>MFPI01</b>	Centrifugal Pump Module	27

<b>MFP102</b>	Axial Flow Pump Module	28	<b>TD1007</b>	Water-to-Air Heat Exchangers	49
<b>MFP103</b>	Positive Displacement Pump Module	28	<b>TD1008</b>	Peltier and Seebeck Effect	49
<b>MFP104</b>	Reciprocating Compressor Module	28	<b>TD1009V</b>	Unsteady State Heat Transfer	47
<b>MFP105</b>	Centrifugal Compressor Module	29	<b>TD1011V</b>	Emissivity – Natural Convection and Radiation	47
<b>MFP106</b>	Centrifugal Fan Module	29	<b>TD1050</b>	Thermal Power Plant with Steam Engine Trainer	51
<b>MFP107</b>	Axial Fan Module	29	<b>TD1060V</b>	Thermal Power Plant with Stream Turbine	51
<b>O</b>			<b>TD1360V</b>	Heat Exchanger Service Module	48
<b>OSI</b>	Oscilloscope	61	<b>TDX00A</b>	Exhaust Gas Calorimeter	53
<b>OTI</b>	Optical Tachometer	61	<b>TE4</b>	Photovoltaic Cells	58
<b>S</b>			<b>TE4A</b>	Solar Light Panel	58
<b>SM110</b>	Hooke's Law and Spring Rate	30	<b>TE6</b>	Humidity Measurement	55
<b>SM1000</b>	Universal Testing Machine	32	<b>TE15</b>	Energy Absorbed at Fracture	33
<b>SM1001</b>	Torsion Testing Machine – 30 Nm	31	<b>TE16</b>	Stiffness, Bending and Torsion	30
<b>SM1002</b>	Benchtop Tensile Testing Machine	32	<b>TE38</b>	Focusing Solar Energy Collector	58
<b>SM1003</b>	Unsymmetrical Cantilever Apparatus	33	<b>TE39</b>	Flat-Plate Solar Thermal Energy Collector	58
<b>SM1004</b>	Beam Apparatus	34	<b>TE3300/02</b>	Pressure Process Training System	16
<b>SM1005</b>	Euler Buckling Apparatus	34	<b>TE3300/03</b>	Flow Process Training System	16
<b>SM1006</b>	Creep Machine	32	<b>TE3300/04</b>	Level Process Training System	16
<b>SM1007</b>	Thin Cylinder	30	<b>TE3300/05</b>	Temperature Process Training System	16
<b>SM1008</b>	Diaphragm	30	<b>TE3300/06</b>	Computer Control System	16
<b>SM1009</b>	Strain Gauge Trainer	31	<b>TE78</b>	Filmwise and Dropwise Condensation and Boiling	47
<b>SM1010</b>	Digital Strain Display	31	<b>TE86</b>	Water Hammer Apparatus	23
<b>SM1011</b>	Thick Cylinder	31	<b>TE93</b>	Cross-Flow Heat Exchanger	49
<b>SM1015 MKII</b>	Rockwell Hardness Tester	33	<b>TE96</b>	Air Bearing Apparatus	42
<b>SM1016</b>	Vickers Hardness Tester	33	<b>TE98</b>	Hertzian Contact Apparatus	42
<b>SM1017</b>	Universal Hardness Tester	33	<b>TE99</b>	Michell Pad Apparatus	42
<b>SM1090V</b>	Rotating Fatigue Machine	31	<b>TM25</b>	Journal Bearing Demonstration	43
<b>ST1</b>	Stroboscope	61	<b>TM160</b>	Free Vibrations Test Frame	45
<b>STF1</b>	Statics Work Panel	35	<b>TM1001</b>	Whirling of Shafts and Critical Speed	43
<b>STF2</b>	Suspension Cable Demonstration	35	<b>TM1002</b>	Static and Dynamic Balancing	44
<b>STF3</b>	Equilibrium of a Rigid Body	35	<b>TM1004</b>	Gyroscope	44
<b>STF4</b>	Equilibrium of Forces	35	<b>TM1005</b>	Centrifugal Force	44
<b>STF5</b>	Equilibrium of a Beam	35	<b>TM1016V</b>	Free and Forced Vibrations	45
<b>STS1</b>	Structures Platform	36	<b>TM1017</b>	Coriolis Force	44
<b>STS2</b>	Bending Moments in a Beam	37	<b>TM1018</b>	Geared Systems	43
<b>STS3</b>	Shear Force in a Beam	37	<b>TM1021V</b>	Cam Analysis Machine	43
<b>STS4</b>	Deflection of Beams and Cantilevers	37	<b>TM1022V</b>	Balance of Reciprocating Masses	44
<b>STS5</b>	Bending Stress in a Beam	37	<b>TM1027</b>	Governors	45
<b>STS6</b>	Torsion of Circular Sections	37			
<b>STS7</b>	Unsymmetrical Bending and Shear Centre	38	<b>V</b>		
<b>STS8</b>	Pin-Jointed Frameworks	38	<b>VDAS®</b>	Versatile Data Acquisition System	59
<b>STS9</b>	Three-Pinned Arch	38	<b>VDAS® e-lab</b>	Versatile Data Acquisition System e-lab	59
<b>STS10</b>	Two-Pinned Arch	38	<b>W</b>		
<b>STS11</b>	Fixed Arch	39	<b>WBI</b>	Work Bench	61
<b>STS12</b>	Euler Buckling of Struts	39			
<b>STS13</b>	Continuous and Indeterminate Beams	39			
<b>STS14</b>	Curved Bars and Davits	39			
<b>STS15</b>	Plastic Bending of Beams	39			
<b>STS16</b>	Plastic Bending of Portals	40			
<b>STS17</b>	Redundant Truss	40			
<b>STS18</b>	Frame Deflections and Reactions	40			
<b>STS19</b>	Simple Suspension Bridge	41			
<b>STS20</b>	Bending Moments in a Portal Frame	41			
<b>STS21</b>	Suspended Beam Bridge	41			
<b>STS22</b>	Equilibrium of a Simply Supported Beam	41			
<b>T</b>					
<b>TD1</b>	Forced Convection Heat Transfer	47			
<b>TD200</b>	Small Engine Test Set	52			
<b>TD300</b>	Regenerative Engine Test Set	53			
<b>TD400</b>	Temperature Measurement and Calibration	50			
<b>TD500</b>	Bomb Calorimeter	50			
<b>TD1000</b>	Ideal Gases – Boyle's Law	46			
<b>TD1001</b>	Ideal Gases – Gay Lussac's Law	46			
<b>TD1002</b>	Heat Transfer Experiments	48			
<b>TD1003</b>	Radiant Transfer Experiments	49			
<b>TD1004V</b>	Expansion of a Perfect Gas	46			
<b>TD1005</b>	Free and Forced Convection	48			
<b>TD1006</b>	Saturated Steam – The Marcet Boiler	50			

## NEWS

SIGN UP



## TECQUIPMENT NEWSLETTER SIGN-UP

Don't miss out on the latest new products, case studies, demonstration videos and blog posts. Sign up to the TecQuipment newsletter today.

[TECQUIPMENT.COM/SUBSCRIBE](https://www.tecquipment.com/subscribe)



## CONTACTING TECQUIPMENT

### PURCHASE ENQUIRIES

For all purchase enquiries please contact the local agent or email: [SALES@TECQUIPMENT.COM](mailto:SALES@TECQUIPMENT.COM)

Purchase enquiries can be:

- Requests for data sheets, catalogues and further information
- Technical advice for product selection prior to purchase
- Prices and quotations

### AFTER SALES

There is a dedicated team of people at TecQuipment that are committed to providing a high level of after-sales care and support to all our customers, past and present.

No matter how old the equipment is, we continue to provide support.

For all after-sales queries please contact:

[CUSTOMER.CARE@TECQUIPMENT.COM](mailto:CUSTOMER.CARE@TECQUIPMENT.COM) or use the forms on our website at: [TECQUIPMENT.COM/CONTACT](http://TECQUIPMENT.COM/CONTACT)

After-sales queries can be:

- Requests for manuals and user guides
- Quotations for spares and consumables
- Post-sales technical advice and support

### SALES PARTNERS

To find the contact and company details for your local TecQuipment representative visit our website at: [TECQUIPMENT.COM/SALES-PARTNERS](http://TECQUIPMENT.COM/SALES-PARTNERS)



MR SAW TUN, LECTURER, SINGAPORE POLYTECHNIC

## BEDFORD COLLEGE'S PRODUCT EXPANSION FOR CONSTRUCTION AND ENGINEERING COURSES

Bedford College's head of department for technical and modern courses, Teddy Kye-Nyarko, shared insights into their extensive TecQuipment product range investment and the positive experience they had both in purchasing the products and with the construction and engineering students using the equipment.

Specialising in construction and engineering courses, Bedford College has been a longstanding user of TecQuipment products, recently acquiring a new batch of apparatus to enhance their teaching methodologies.

Key products employed in their curriculum include:

- Beam Apparatus (SM1004)
- Euler Buckling Apparatus (SM1005)
- Universal Testing Machine (SM1000)
- Strain Gauge Trainer (SM1009)
- Engineering Science Work Panel (ES1) and Tensile Tester Kit (ES6)
- Strain Gauge Kit (E19)
- Statics Work Panel (STF1), and more.

The flexibility of customer support, whether through online communication or on-site assistance, demonstrated TecQuipment's commitment to ensuring a seamless experience for educators. For students it is the convenience of the product user guides, which are designed to be user-friendly and include exercises that facilitate easy integration into the coursework. They eliminate the need for additional preparation and allow students to spend more time hands-on learning in practical labs.



TEDDY KYE-NYARKO, HEAD OF DEPARTMENT, TECHNICAL AND MODERN COURSES, BEDFORD COLLEGE



# DRIVING AEROSPACE ENGINEERING AND THERMO FLUID SCIENCE COURSES AT KENT STATE UNIVERSITY

Driven by a commitment to excellence and with a vision to establish a robust program in aerospace engineering and thermal fluid sciences, Dr Aziz explored various product options before deciding to integrate TecQuipment's teaching apparatus into Kent State University's cutting-edge curriculum and recently inaugurated state-of-the-art Aeronautics and Engineering building.

Kent State's aerospace engineering program, led by Dr Aziz, boasts a thermo fluids sciences lab equipped with an array of TecQuipment apparatus. This includes products such as:

- Bernoulli's Theorem (H5)
- Flow Measurement (H10)
- Ideal Gases – Boyle's Law (TD1000)
- Viscosity and Particle Drag (H410)
- Centre of Pressure (H11)
- Osborne Reynolds Apparatus (H215), and more.

The lab also incorporates heat transfer apparatus for both linear and radial heat transfer, enhancing the understanding of fundamental principles.

The lab sessions cover a range of experiments each week, providing hands-on experience in fluid mechanics, heat transfer and thermal dynamics.

TecQuipment's Subsonic Wind Tunnel (AF1300) is also used in a separate research-focused lab for applied fluid dynamics. It serves as a valuable tool for testing model aircraft and various geometries, enabling students to explore aerodynamics applications. One notable experiment involves studying the effect of winglet configurations on model airplanes, providing valuable insights into aerodynamic performance.

Kent State University's collaboration with TecQuipment solidifies its commitment to providing students with an outstanding learning experience focused on a comprehensive and practical understanding of aerospace engineering. The success of Dr Aziz's thermal fluids laboratory serves as a testament to TecQuipment's pivotal role in advancing the next generation of engineers.





# YORK COLLEGE OF PENNSYLVANIA'S ENTHUSIASM FOR TECQUIPMENT'S FLUID MECHANICS PRODUCTS

At York College of Pennsylvania in the Civil and Mechanical Engineering Department, the enthusiasm for fluid mechanics is palpable, with students frequently expressing awe at the impressive and user-friendly equipment provided by TecQuipment.

They emphasise the flawless performance of TecQuipment's equipment, praising its reliability during lab sessions. The equipment's ability to generate meaningful data without complications eliminates the need for extensive discussions on apparatus or equipment errors, allowing for a smooth and efficient learning experience.



TecQuipment's user guides receive high praise for their clarity, multiple usage options and inclusion of sample results, making them valuable teaching tools. They allow students to explore various experiments with the same equipment and provide a template for data collection, streamlining the learning process.



Students at York College of Pennsylvania thoroughly enjoy the equipment demos, finding the larger apparatus like the **Fluid Friction Apparatus** (H408), **Rainfall Apparatus** (H313) and **Flume** (FC50) particularly impressive. The civil engineering course, structured to introduce various sub-disciplines, incorporates fluid mechanics, hydraulics, and hydrology, providing students with a well-rounded education that is focused on real-world applications of civil engineering.

TecQuipment's **Hydrology and Rainfall Apparatus** (H313) proves invaluable for teaching concepts related to stormwater and detention basins. The **Discharge Over a Notch apparatus** (H6) aids in studying different outlet structures, preparing students for challenges in water resource engineering.

TecQuipment's dedication to providing quality equipment and exceptional support for the products purchased play a pivotal role in shaping the fluid mechanics curriculum at York College of Pennsylvania and its educational goals.



# EXPLORING NAZARBAYEV UNIVERSITY'S AEROSPACE RESEARCH WITH TECQUIPMENT'S SUBSONIC WIND TUNNEL (AF1600S)

Discover how Nazarbayev University in Kazakhstan uses TecQuipment's Subsonic Wind Tunnel (AF1600S) to conduct unique experiments in aerospace engineering. Led by Associate Professor Basman Elhadidi and his students, the university's Department of Mechanical and Aerospace Engineering utilises this apparatus to delve into aerodynamics, flight performance and flight dynamics.

The Subsonic Wind Tunnel (AF1600S) offers unparalleled flexibility, equipped with a force balance for measuring lift, drag and pitching moment, alongside a versatile data acquisition system. From introductory studies on aerofoil characteristics to advanced experiments in aircraft trim, performance and control, students engage in hands-on learning that bridges theoretical concepts with practical applications.

Through innovative experiments, such as demonstrating aircraft trim and performance, students gain a deeper understanding of flight mechanics, performance dynamics and longitudinal flight modes. The wind tunnel's adaptability allows for custom-designed models and real-time data capture, enriching the learning experience and preparing students for real-world challenges in aerospace engineering.

Associate Professor Elhadidi emphasises the importance of this apparatus in integrating theory with application, providing students with invaluable insights into aerodynamics and flight behaviour. As Nazarbayev University continues to pioneer aerospace research, the Subsonic Wind Tunnel (AF1600S) serves as a cornerstone in nurturing students' curiosity and innovation, propelling them towards future success in the field.





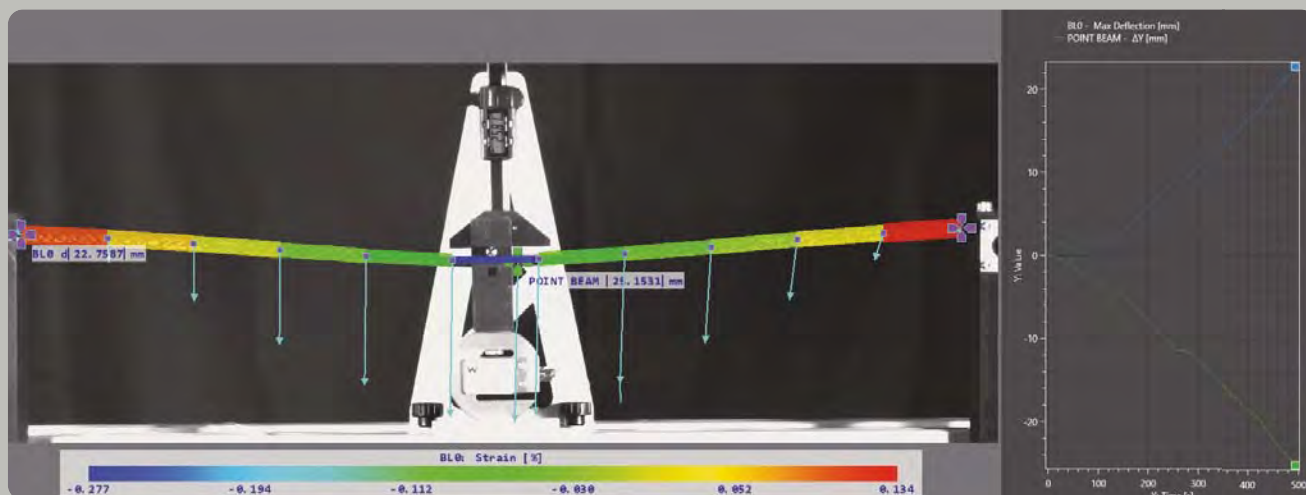
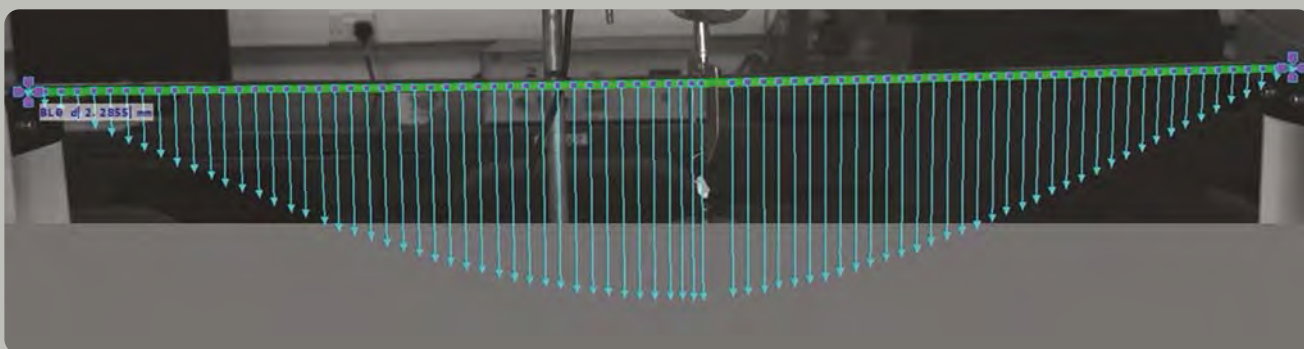
NEW



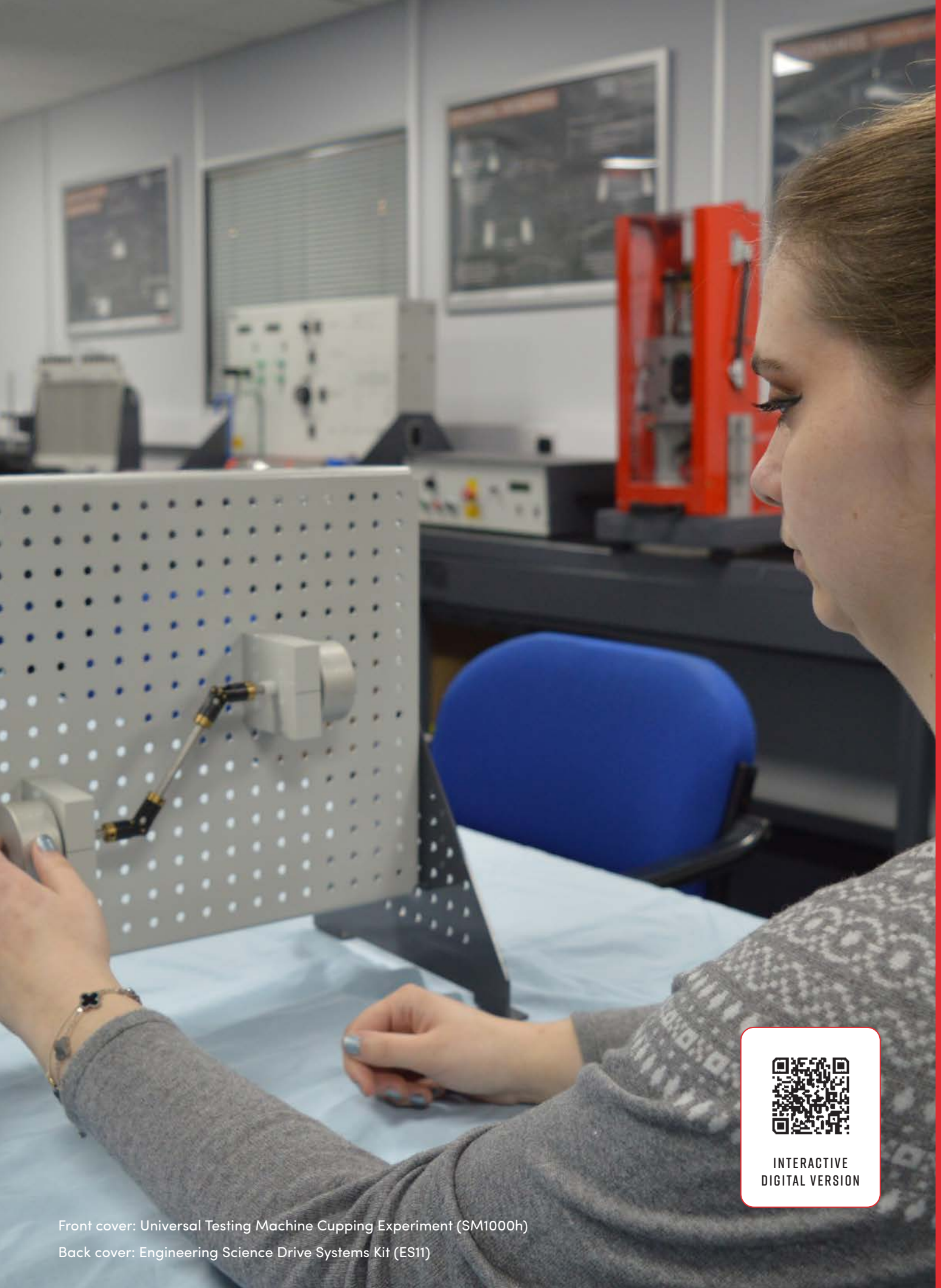
# OPTICAL EXTENSOMETRY

## DEFLEX<sup>®</sup>

Visualise and measure strain, displacements, extensions and deformations in materials, shapes and structures.







INTERACTIVE  
DIGITAL VERSION

Front cover: Universal Testing Machine Cupping Experiment (SM1000h)

Back cover: Engineering Science Drive Systems Kit (ES11)