

PRODUCT PORTFOLIO

ENGINEERING EXCELLENCE IN EDUCATION



TECQUIPMENT



ISSUE 1



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

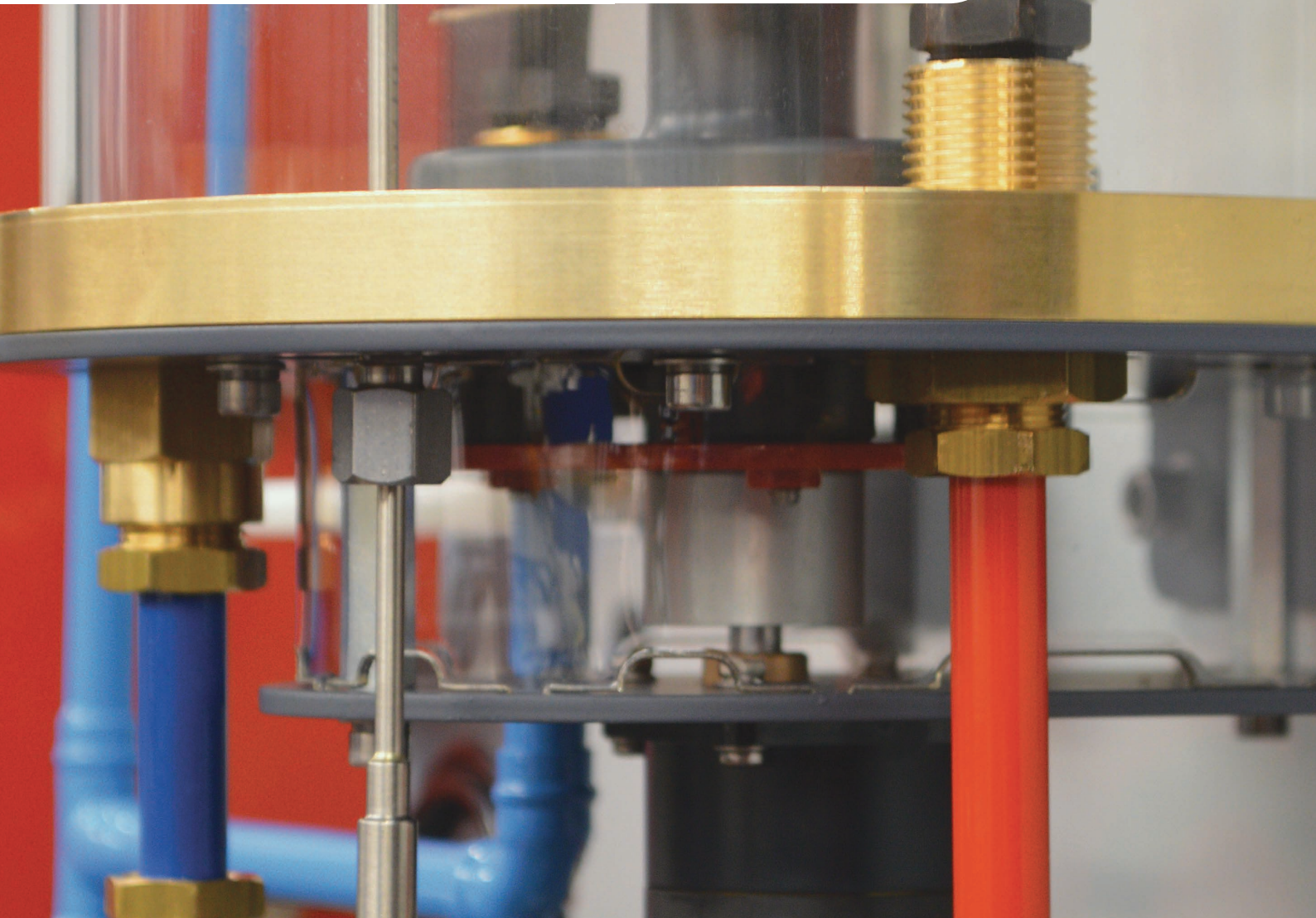
≡ WELCOME TO THE TECQUIPMENT PRODUCT PORTFOLIO

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 or contact your local TecQuipment Sales Partner who can be found on the website at tecquipment.com/sales-partners.



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ENGINEERING SCIENCE

PACKAGES AND FRAME

FORCES AND MOMENTS

MATERIALS TESTING

VIBRATION, FRICTION AND ENERGY

SIMPLE MACHINES

MECHANISMS

ENGINEERING SCIENCE FULL SET ^{ESF}

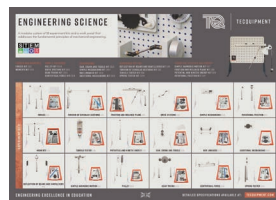
A complete set of TecQuipment's Engineering Science kits and three work panels within a mobile trolley.



WORK PANEL

ESI

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



EXPERIMENT KITS POSTER




AVAILABLE EXPERIMENT KITS:

• Forces Kit (ES2)	3
• Moments Kit (ES3)	3
• Deflection of Beams and Cantilevers Kit (ES4)	3
• Torsion of Circular Sections Kit (ES5)	3
• Tensile Tester Kit (ES6)	4
• Simple Harmonic Motion Kit (ES7)	4
• Friction and Inclined Plane Kit (ES8)	4
• Potential and Kinetic Energy Kit (ES9)	4
• Pulley Kit (ES10)	4
• Drive Systems Kit (ES11)	5
• Cam, Crank and Toggle Kit (ES12)	5
• Gear Trains Kit (ES13)	5
• Simple Mechanisms Kit (ES14)	5
• Bar Linkages Kit (ES15)	5
• Centrifugal Force Kit (ES16)	5
• Rotational Friction Kit (ES17)	6
• Additional Mechanisms Kit (ES18)	6
• Spring Tester Kit (ES19)	6

PACKAGES

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

MATERIALS TESTING KIT PACKAGE ESB2



FOUR WORK PANELS ESI

+

- DEFLECTION OF BEAMS AND CANTILEVERS KIT ES4
- TORSION OF CIRCULAR SECTIONS KIT ES5
- TENSILE TESTER KIT ES6
- SPRING TESTER KIT ES19

SIMPLE MACHINES KIT PACKAGE ESB3




FOUR WORK PANELS ESI

+

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

MECHANISMS KIT PACKAGE ESB4




FOUR WORK PANELS ESI

+

- 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 ESI

+

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

FORCES AND MOMENTS KIT PACKAGE ESB1



TWO WORK PANELS ESI

- +
- FORCES KIT ES2
 - MOMENTS KIT ES3

FORCES KIT ES2

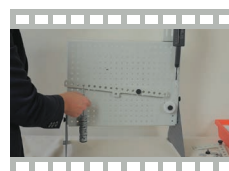
Demonstrates how to find the centre of gravity of shapes and the relationship between angles and coplanar forces, using force triangles.



MOMENTS KIT ES3

ES3

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



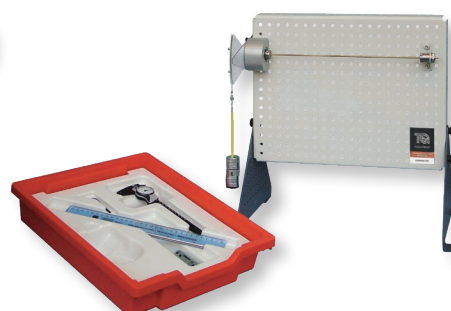
DEFLECTION OF BEAMS AND CANTILEVERS KIT ES4

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



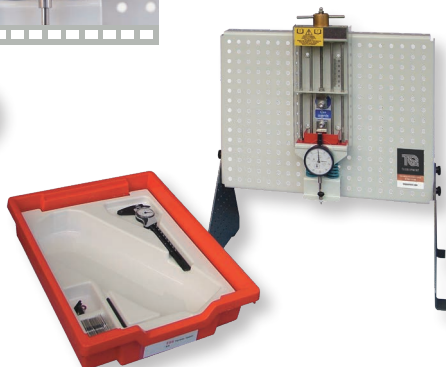
TORSION OF CIRCULAR SECTIONS KIT ES5

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



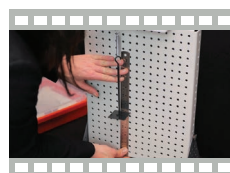
≡ TENSILE TESTER KIT ES6

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

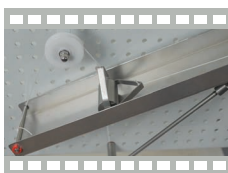
Demonstrates simple harmonic motion (oscillation) in springs and pendulums, and its usefulness.



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.



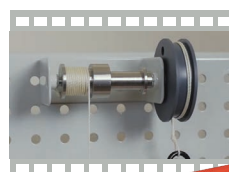
≡ POTENTIAL AND KINETIC ENERGY KIT ES9

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

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.



≡ GEAR TRAINS KIT ES13

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



≡ BAR LINKAGES KIT ES15

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



≡ 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.



≡ SIMPLE MECHANISMS KIT ES14

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



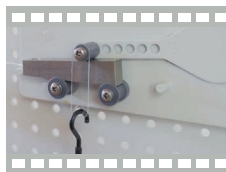
≡ CENTRIFUGAL FORCE KIT ES16

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.



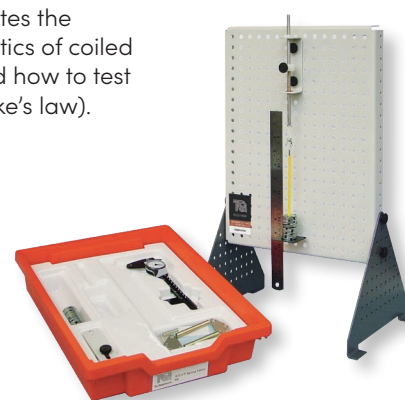
≡ ADDITIONAL MECHANISMS KIT ES18

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).



≡ VIDEO CASE STUDY

WEST NOTTINGHAMSHIRE COLLEGE USES TEACHING APPARATUS TO SOLVE REAL WORLD PROBLEMS

The students at West Nottinghamshire College have been using TecQuipment's Universal Testing Machine (SM1000) to test the strength of 3D printed materials.

TecQuipment's teaching apparatus is often used for teaching specific learning objectives as part of the syllabus, but in reality offer a much wider scope of learning.

Tom O'Sullivan, course lecturer, explains more about how the Universal Testing Machine is used to test 3D printed materials that are used in products made by the engineering students' Learning Company, that designs and manufactures custom-made products.

Watch for the full story: [TECQUIPMENT.COM/CASE-STUDIES/WEST-NOTTINGHAM-COLLEGE](https://tecquipment.com/case-studies/west-nottingham-college)



AERODYNAMICS

SUBSONIC WIND TUNNELS

SPECIAL PURPOSE WIND TUNNELS

SUPERSONIC NOZZLE

SUPERSONIC WIND TUNNELS

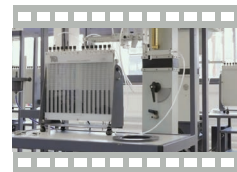


MODULAR AIR FLOW BENCH AF10

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) 7
- Drag Force (AF12) 7
- Round Turbulent Jet (AF13) 8
- Boundary Layer (AF14) 8
- Flow Around a Bend (AF15) 8
- Coandă Effect and Jet Flow (AF16) 8
- Flow Visualisation (AF17) 8
- Tapped Aerofoil (AF18) 8

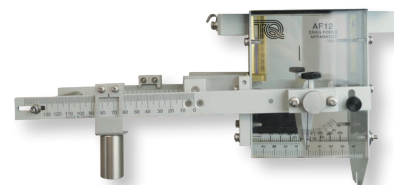
BERNOULLI'S EQUATION AF11

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.



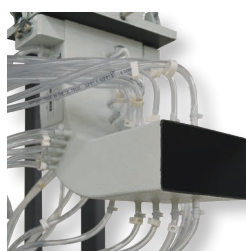
BOUNDARY LAYER AF14

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.



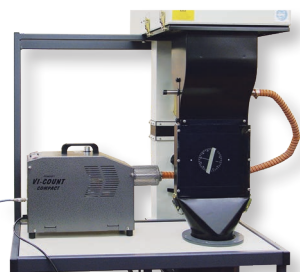
COANDĂ EFFECT AND JET FLOW AF16

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.



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 305 MM AF1300

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.

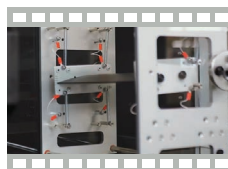


EXPERIMENT MODELS:

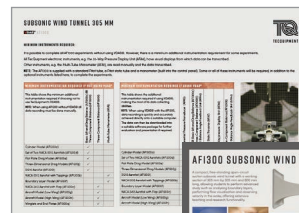
- Cylinder Model with Tapping (AF1300a)
- NACA 0012 Aerofoil with Tappings (AF1300b)
- NACA 2412 Aerofoil with Flap (AF1300c)
- Set of Two NACA 0012 Aerofoils (AF1300d)
- 100 mm Diameter Flat Plate (AF1300e)
- Boundary Layer Model (AF1300f)
- Aircraft Model (Low Wing) (AF1300g)
- Aircraft Model (High 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
POSTER

The Subsonic Wind Tunnel is also available with working sections of 450 mm (AF1450S) and 600 mm (AF1600S) for more advanced studies.



AF1450S



AF1600S



FLOW VISUALISATION WIND TUNNEL

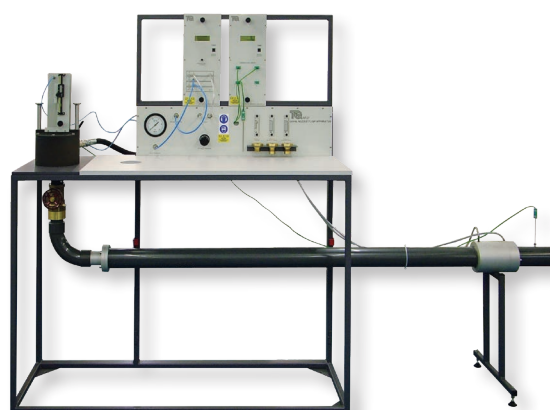
AF80

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.



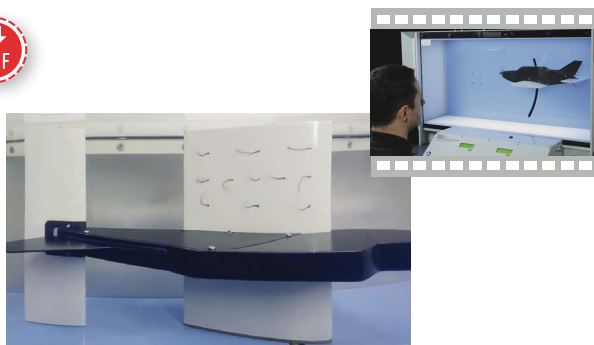
LAVAL NOZZLE FLOW APPARATUS AF27 VDAS®

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.



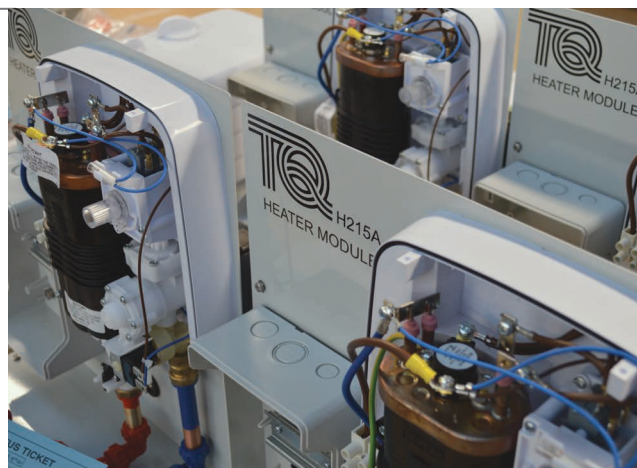
FLIGHT DEMONSTRATION WIND TUNNEL AF4IV VDAS®

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.



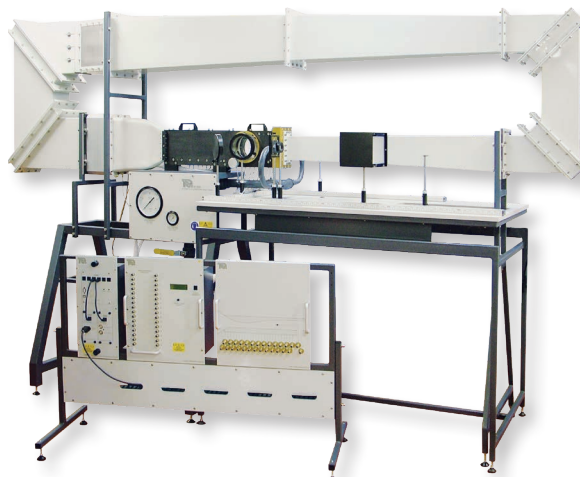
QUALITY CONTROL WITH IN-HOUSE PRODUCTION

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.



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



HERE TO HELP YOU

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

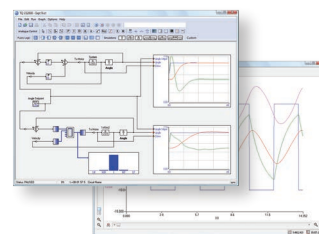
CUSTOMER.CARE@TECEQUIPMENT.COM



CONTROL ENGINEERING

≡ CONTROL SOFTWARE CE2000

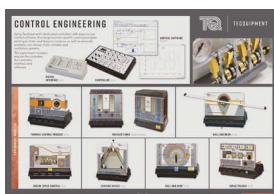
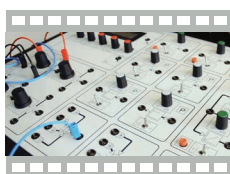
Software that simulates control systems and works with TecQuipment's controller (CE120) or digital interface (CE122) to control and acquire data from TecQuipment's Control Engineering range.



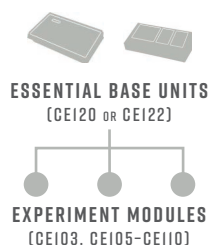
≡ CONTROLLER

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.

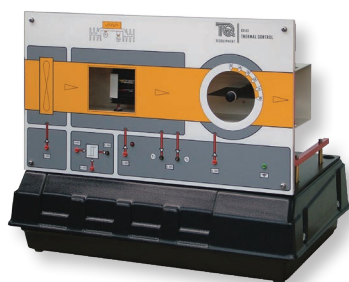


AVAILABLE EXPERIMENT MODULES:

- Thermal Control Process Apparatus (CE103) 12
- Coupled Tanks Apparatus (CE105/CE105MW) 13
- Ball and Beam Apparatus (CE106) 12
- Engine Speed Control Apparatus (CE107) 13
- Coupled Drives Apparatus (CE108) 13
- Ball and Hoop Apparatus (CE109) 13
- Servo Trainer (CE110) 13

≡ THERMAL CONTROL PROCESS APPARATUS CE103

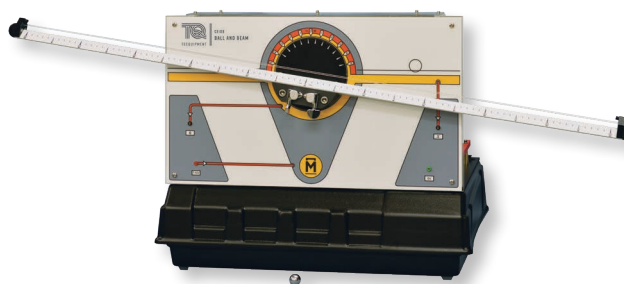
A self-contained benchtop temperature control apparatus that mimics common industrial processes, designed to allow students at all academic levels to investigate the basic and advanced principles of control.



≡ 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.



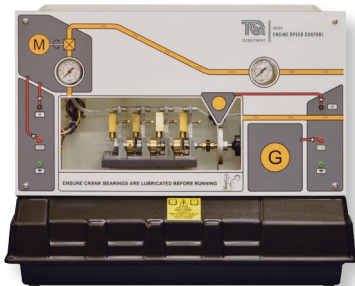
MULTIVARIABLE COUPLED TANKS APPARATUS CE105MV

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.



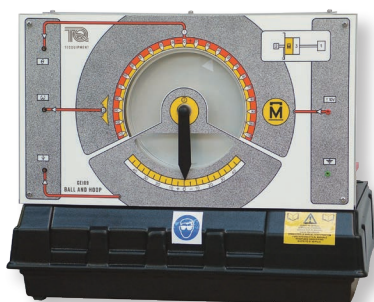
COUPLED DRIVES APPARATUS CE108

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.



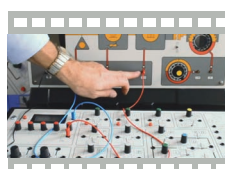
BALL AND HOOP APPARATUS CE109

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.





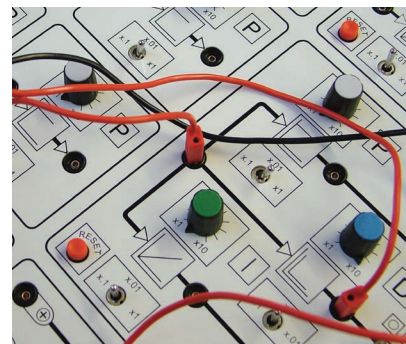
PROCESS CONTROL ENGINEERING

DIGITAL CONTROL

PROCESS CONTROL

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).



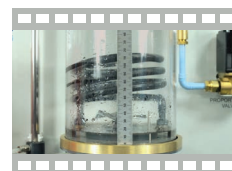
PLC PROCESS CE111

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

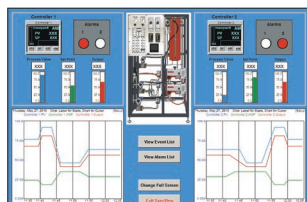
A self-contained, benchtop, fully integrated teaching apparatus that mimics industrial process engineering, including a comprehensive range of experiments in flow, level, pressure and temperature, ranging from basic theories through to more advanced principles.



AS SEEN ON THE
INSIDE FRONT COVER

CONTROL AND INSTRUMENTATION STUDY STATION TE37

A laboratory-scale model of a typical industrial process plant providing the essential facilities to allow flow level temperature and pressure control. Demonstrates applications of advanced control systems using industry-standard instrumentation and controls for the training of plant technicians and process control engineers.



DISTRIBUTED CONTROL SYSTEM TE37DCS

Easy-to-use software that connects to the Control and Instrumentation Study Station (TE37) for remote control and monitoring of processes (distributed control).



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

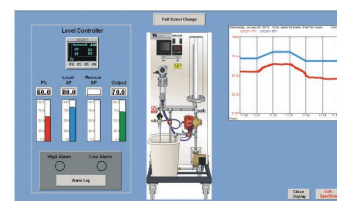
TE3300/05

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.



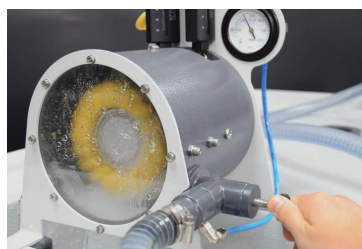
COMPUTER CONTROL SYSTEM TE3300/06

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



PLAY NOW - TECQUIPMENT YOUTUBE CHANNEL YouTube

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



FLUID MECHANICS

DIGITAL HYDRAULIC BENCH

FLOW AND PRESSURE MEASUREMENT

PIPE FRICTION AND ENERGY LOSS

LAMINAR AND TURBULENT FLOW

NOZZLES AND JETS

VORTICES AND CAVITATION

FLOW VISUALISATION

PIPE SURGE AND WATER HAMMER

OPEN CHANNEL FLOW

HYDROSTATICS AND PROPERTIES OF FLUIDS

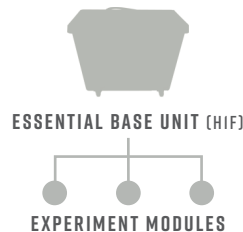
HYDROLOGY

PUMPS AND TURBINES

MODULAR FLUID POWER (PUMPS, TURBINES
AND COMPRESSORS)

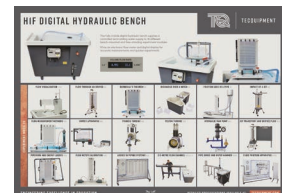
≡ DIGITAL HYDRAULIC BENCH HIF

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) 17
- 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
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- Vortex Apparatus (H13) 21
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- Pipe Surge And Water Hammer (H405) 21
- 2.5 Metre Flow Channel (FC50-2.5) 22
- Francis Turbine (H18) 25
- Pelton Turbine (H19) 25
- Hydraulic Ram Pump (H31) 25

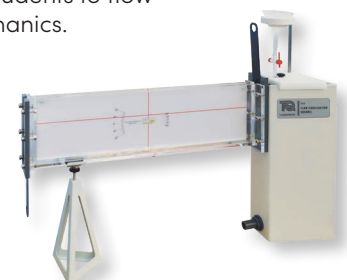
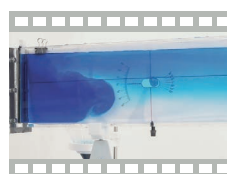


EXPERIMENT MODULES POSTER



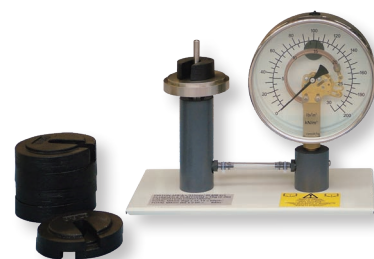
≡ FLOW VISUALISATION FC15

A compact, entry-level piece of equipment for visualising flow patterns around weirs and other objects in an open channel. A range of models supplied in the package make this an ideal product for introducing students to flow visualisation in fluid mechanics.



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.



DISCHARGE OVER A NOTCH H6

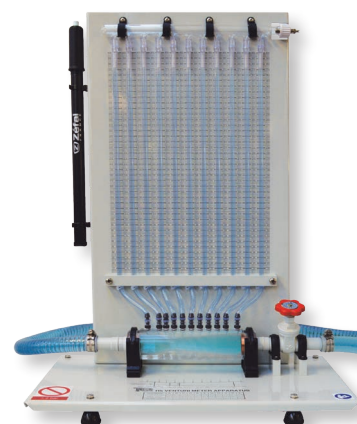
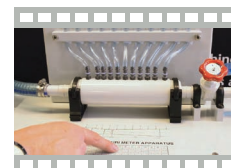
H6

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



BERNOULLI'S THEOREM H5

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



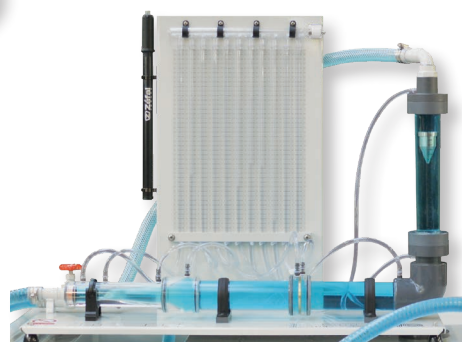
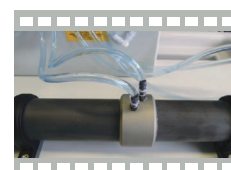
PRESSURE MEASUREMENT BENCH H30

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

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.



≡ FLOW METER CALIBRATION H40

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



EXPERIMENT MODULES:



Pitot Tube (H40a)

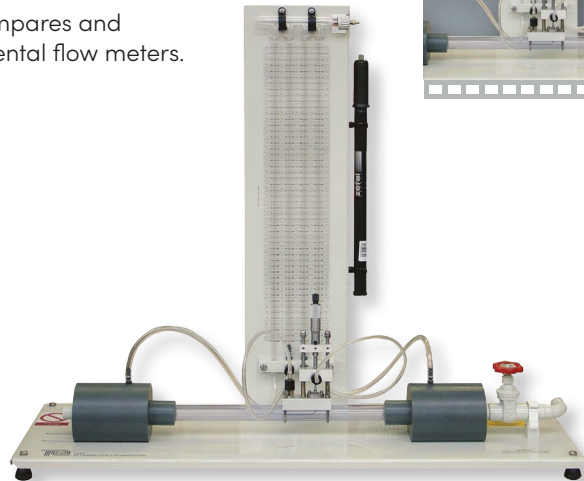
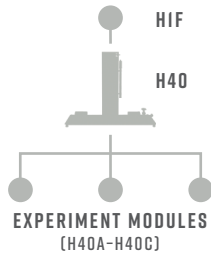


Venturi Flow Meter (H40b)

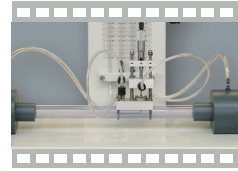


Orifice Flow Meter (H40c)

ESSENTIAL BASE UNITS

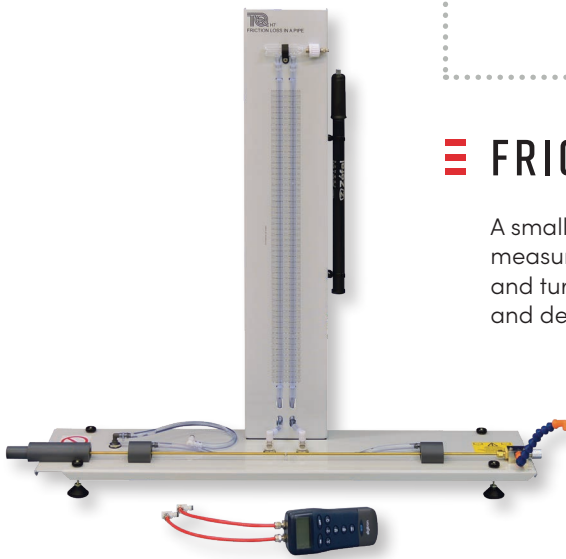


SHOWN FITTED WITH THE OPTIONAL PITOT TUBE (H40A)
EXPERIMENT MODULE



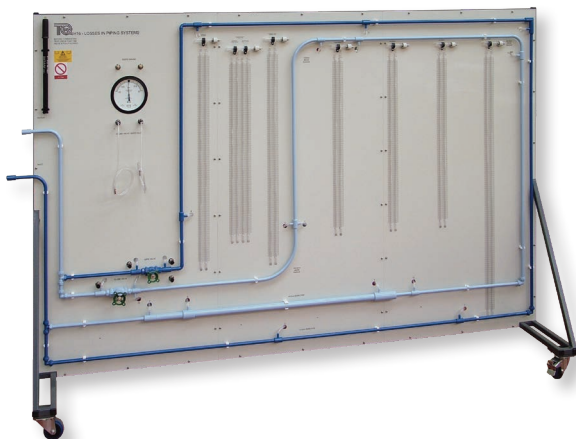
≡ FRICTION LOSS IN A PIPE H7

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

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



≡ LOSSES IN PIPING SYSTEMS

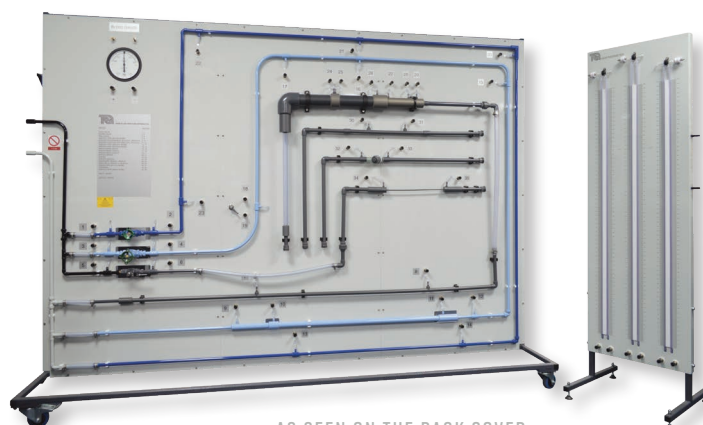
H16

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

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.



AS SEEN ON THE BACK COVER

≡ 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.

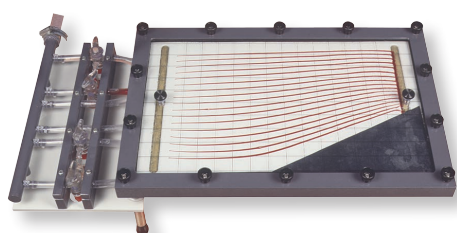
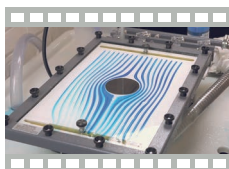


OPTIONAL HEATER MODULE (H215A)



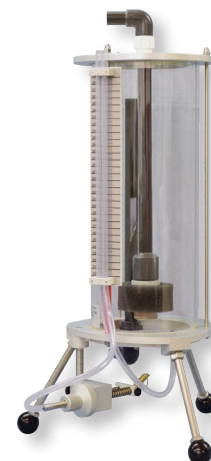
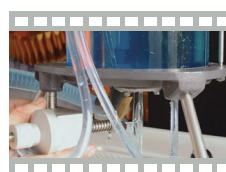
≡ HELE-SHAW APPARATUS H9

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

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



≡ IMPACT OF A JET H8

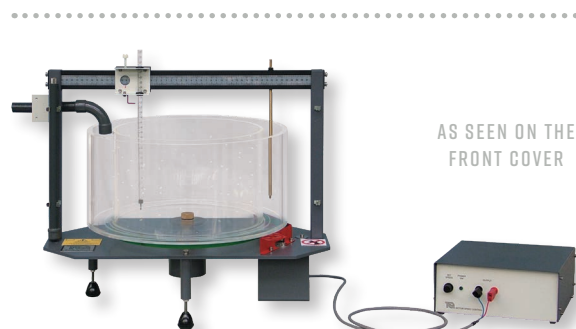
A cylindrical tank for investigating the force generated by a jet striking plates (representing turbine vanes) to aid in the understanding of how turbines work.



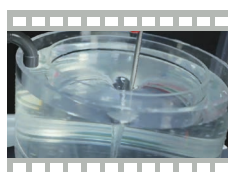
JET TRAJECTORY AND ORIFICE FLOW

H33

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.



AS SEEN ON THE
FRONT COVER



VORTEX APPARATUS H13

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



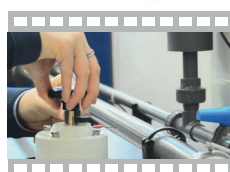
CAVITATION IN A VENTURI H400

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.



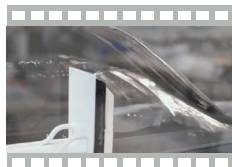
PIPE SURGE AND WATER HAMMER H405 VDAS®

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



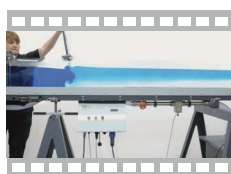
2.5-METRE FLUME FC50-2.5

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.



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.

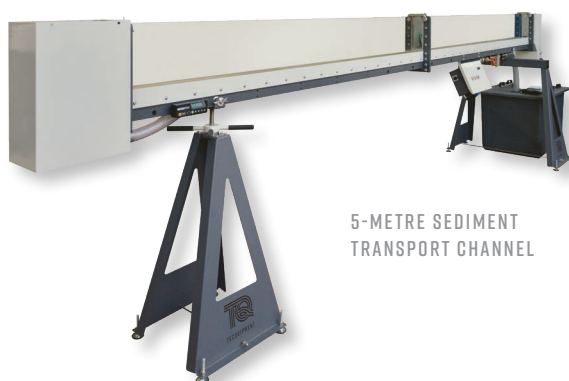


AVAILABLE MODELS:

- 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)



MODELS POSTER



5-METRE SEDIMENT
TRANSPORT CHANNEL

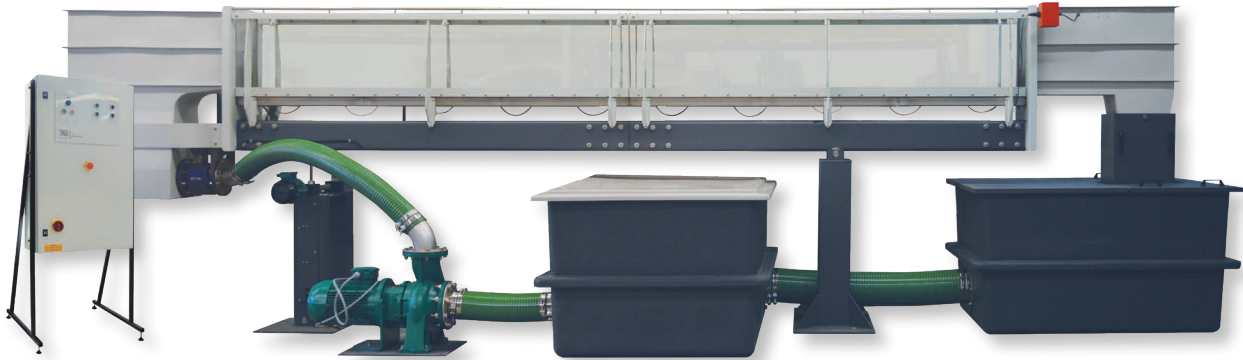


FLOW UNDER A SLUICE GATE

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)



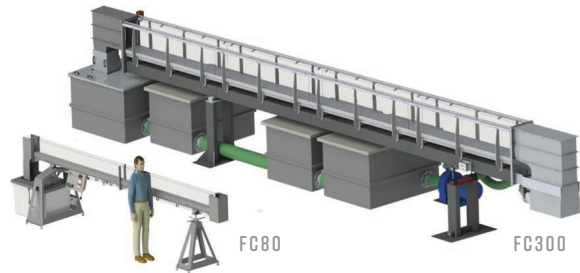
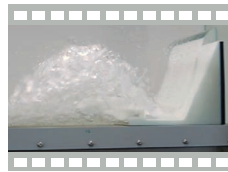
Sediment Loop (FC300sl)



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

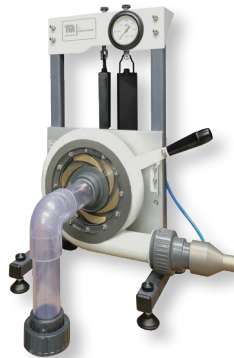
H313V **VDAS**
ONBOARD

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

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



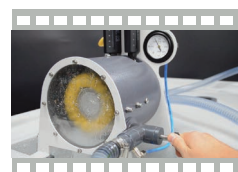
PELTON TURBINE H19

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

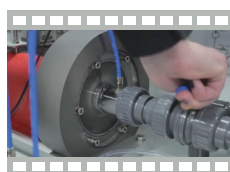
A compact experiment for use with the Hydraulic Bench (H1F) to demonstrate the use of water hammer to create a pumping action.



☐ 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.



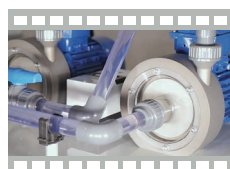
☐ TWO-STAGE (SERIES AND PARALLEL) PUMPS H83 **VDAS**®

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.

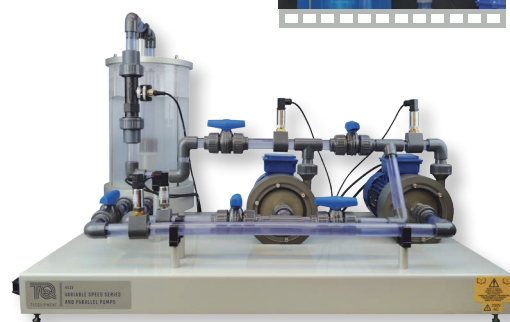
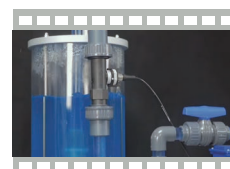


☐ SERIES AND PARALLEL PUMPS H52 / H53V **VDAS**® ONBOARD

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 (H85g)

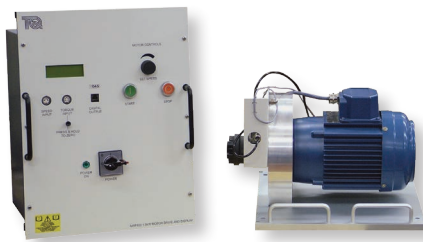


SHOWN WITH OPTIONAL GEAR PUMP MODULE

UNIVERSAL DYNAMOMETER

MFP100

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



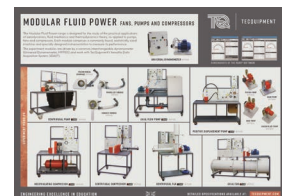
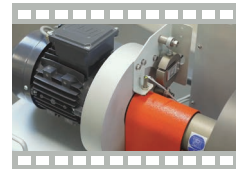
EXPERIMENT MODULES:

- | | |
|--|----|
| • 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)

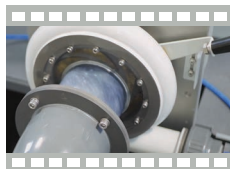
EXPERIMENT MODULES (MFP101-MFP107)






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 (MFPI03a)
-  Gear Pump (MFPI03b)
-  Vane Pump (MFPI03c)
-  Swash Plate Pump (MFPI03d)



RECIPROCATING COMPRESSOR MODULE

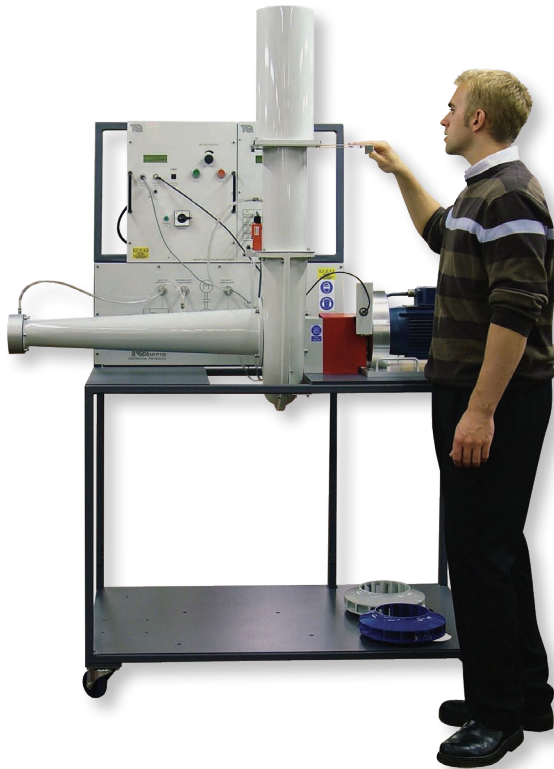
MFPI04 **VDAS**®

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.



MATERIALS TESTING AND PROPERTIES

BASIC ELASTIC PROPERTIES

STRESS AND STRAIN ANALYSIS

TORSION TESTING

FATIGUE TESTING

CREEP TESTING

TENSILE AND UNIVERSAL TESTING MACHINES

IMPACT TESTING

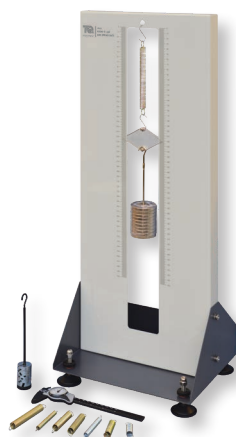
INDUSTRIAL HARDNESS TESTERS

TEST SPECIMENS

FREE-STANDING STRUCTURES EXPERIMENTS

≡ HOOKE'S LAW AND SPRING RATE SM110

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



≡ 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.



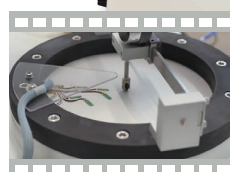
≡ STIFFNESS, BENDING AND TORSION TE16

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



≡ DIAPHRAGM SM1008 VDAS®

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



THICK CYLINDER SM1011 VDAS®

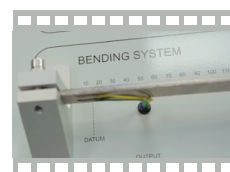
Benchtop machine to allow students to perform stress and strain tests on a thick-walled cylinder.



STRAIN GAUGE TRAINER SM1009 VDAS®

SM1009 VDAS®

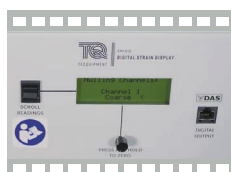
Benchtop bending system to test tension, torsion and bending to illustrate how resistance strain gauges work and methods of measuring strains in different structures. Can be used to demonstrate Young's modulus and Poisson's ratio.



DIGITAL STRAIN DISPLAY SM1010 VDAS®

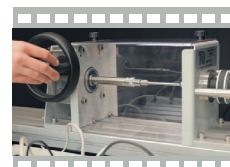
SM1010 VDAS®

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



TORSION TESTING MACHINE, 30 NM SM1001 VDAS®

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



STRAIN GAUGE KIT E19

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



ROTATING FATIGUE MACHINE SM1090V VDAS®

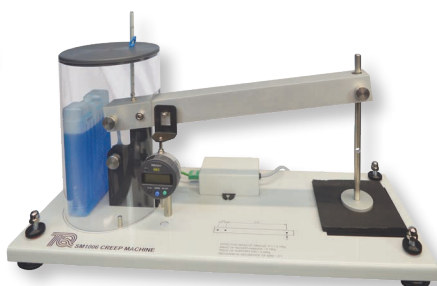
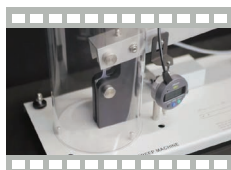
A benchtop machine for demonstrating the failure of materials when subjected to an alternating stress, showing both low and high cycle fatigue.



≡ CREEP MACHINE

SM1006 **VDAS**®

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



≡ BENCHTOP TENSILE TESTING MACHINE SM1002 **VDAS**®

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



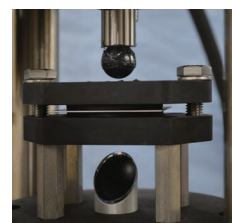
≡ UNIVERSAL TESTING MACHINE SM1000 **VDAS**®

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



EXPERIMENT MODULES:

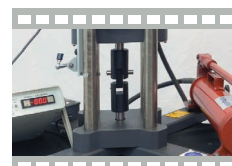
- Brinell Indenter (SM1000e)
- Coil Spring (SM1000f)
- Beam and Leaf Spring (SM1000g)
- Cupping Experiment (SM1000h)
- Double Shear Experiment (SM1000j)
- Disc Spring Experiment (SM1000k)



CUPPING EXPERIMENT



UNIVERSAL TESTING MACHINE



CUPPING, SPRING AND SHEAR EXPERIMENT



VIDEO CASE STUDY

≡ MATERIALS LABORATORY WITH DATA CAPTURE MF40 MKII

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



ENERGY ABSORBED AT FRACTURE TEI15

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



ROCKWELL HARDNESS TESTER SM1015

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.



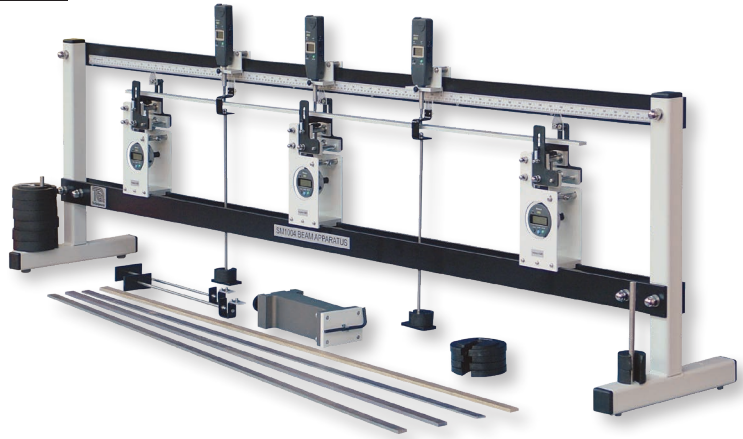
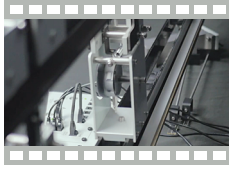
UNSYMMETRICAL CANTILEVER APPARATUS SM1003 VDAS®

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



BEAM APPARATUS SM1004 VDAS®

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.



COMPOSITE BEAM SETS



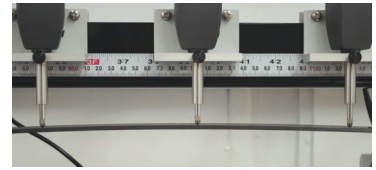
Basic Composite Beam Set (SM1004d1 / SM1005b1)



Cored Composite Beam Set (SM1004d2 / SM1005b2)



Variable Stiffness Composite Beam Set (SM1004d3 / SM1005b3)



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.



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)



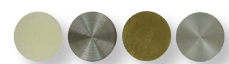
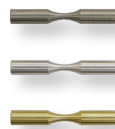
Tensile Test Specimens (ML)



Hardness Test Specimens (HTP)



Hardness Reference Blocks (HTB)



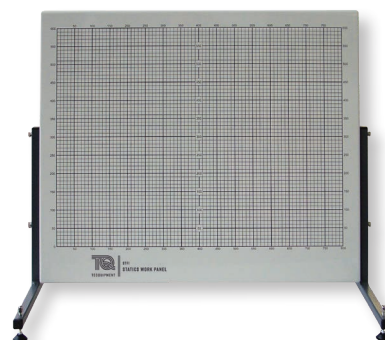
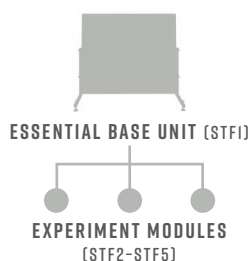
STATICS FUNDAMENTALS



STATICS WORK PANEL

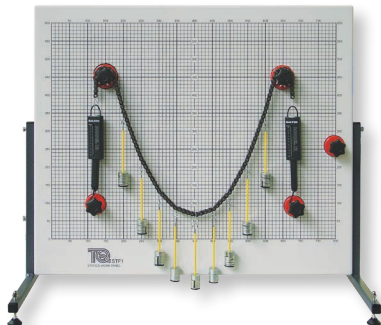
STF1

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



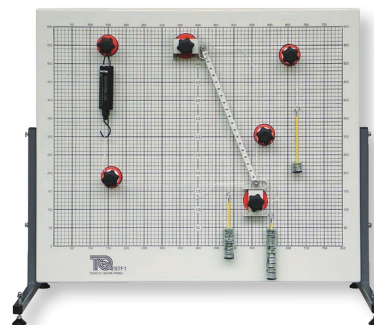
SUSPENSION CABLE DEMONSTRATION STF2

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

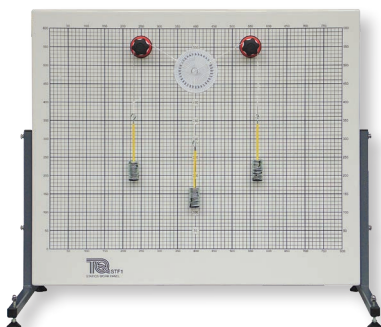
A kit for use with the work panel that demonstrates the forces around a ladder-type structure.



EQUILIBRIUM OF FORCES STF4

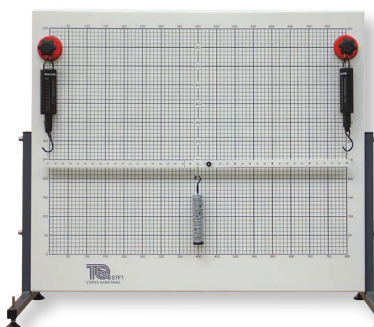
STF4

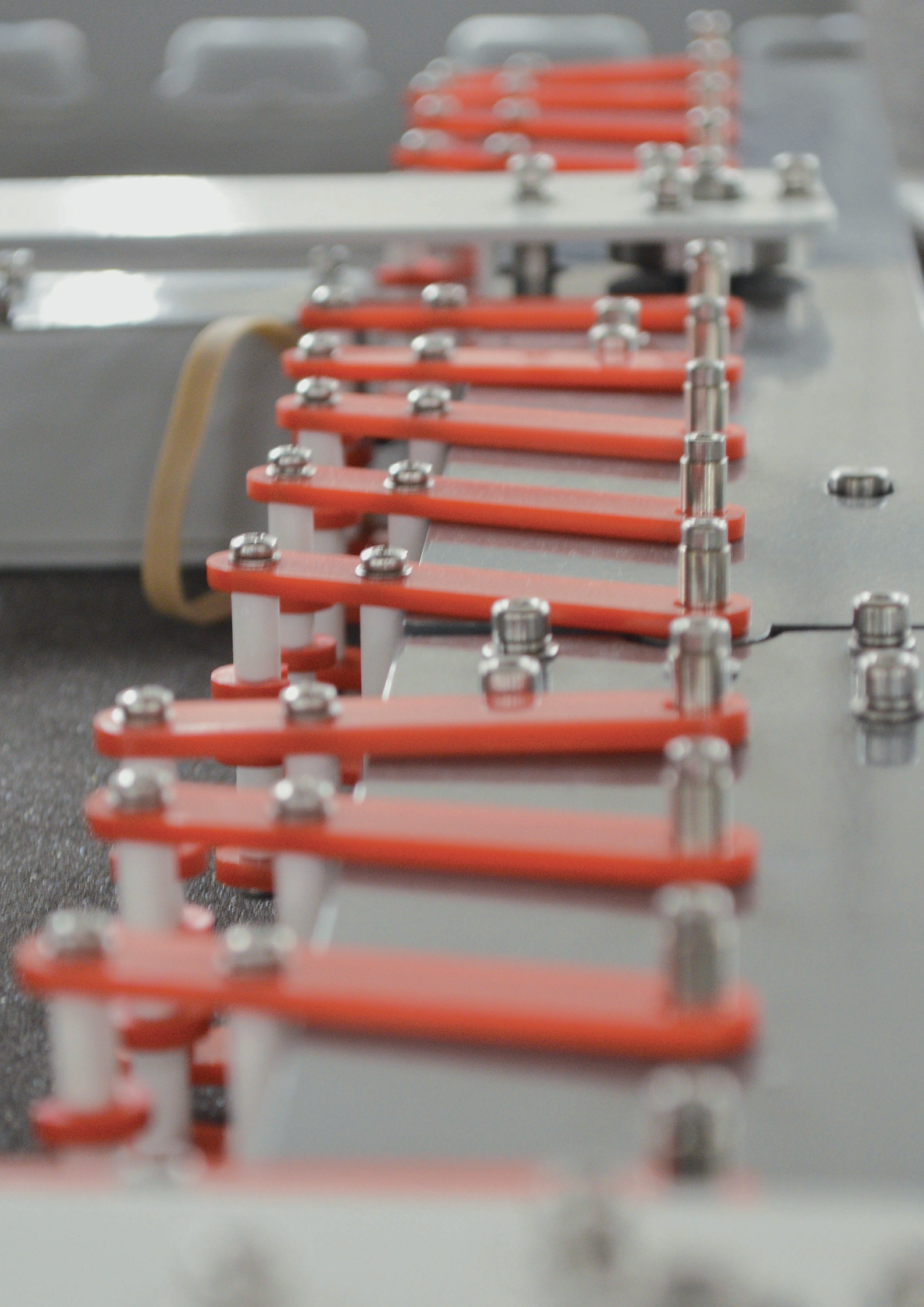
A kit for use with the work panel for experiments with three or more coplanar forces at equilibrium and an introduction to Bow's notation.



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

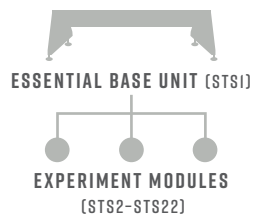
TORSION

STRUCTURES PLATFORM STS1

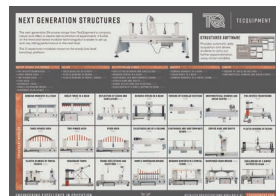
A benchtop platform that holds the experiments of the Structures range.



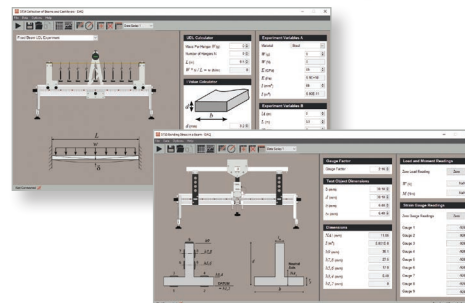
INTRODUCTION TO NEXT GENERATION STRUCTURES



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) 39
- Three-Pinned Arch (STS9) 39
- Two-Pinned Arch (STS10) 39
- Fixed Arch (STS11) 40
- Redundant Truss (STS17) 41
- Simple Suspension Bridge (STS19) 41
- Suspended Beam Bridge (STS21) 42

FAILURE

- Euler Buckling of a Column (STS12) 40
- Plastic Bending of Beams (STS15) 40
- Plastic Bending of Portals (STS16) 41

DEFLECTIONS AND STRESS

- Deflection of Beams and Cantilevers (STS4) 38
- Bending Stress in a Beam (STS5) 38
- Continuous and Indeterminate Beams (STS13) 40
- Curved Bars and Davits (STS14) 40
- Frame Deflections and Reactions (STS18) 41

MOMENTS

- Bending Moments in a Beam (STS2) 38
- Shear Force in a Beam (STS3) 38
- Bending Moments in a Portal Frame (STS20) 41
- Equilibrium of a Simply Supported Beam (STS22) 42

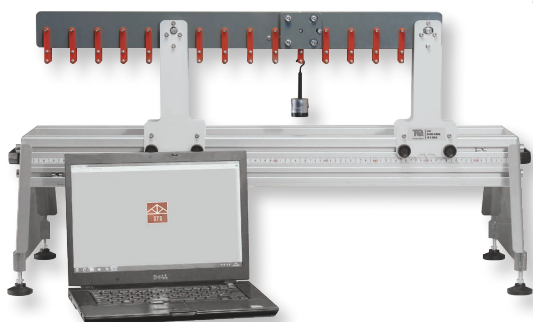
TORSION

- Torsion of Circular Sections (STS6) 38
- Unsymmetrical Bending and Shear Centre (STS7) 39

≡ BENDING MOMENTS IN A BEAM STS2



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



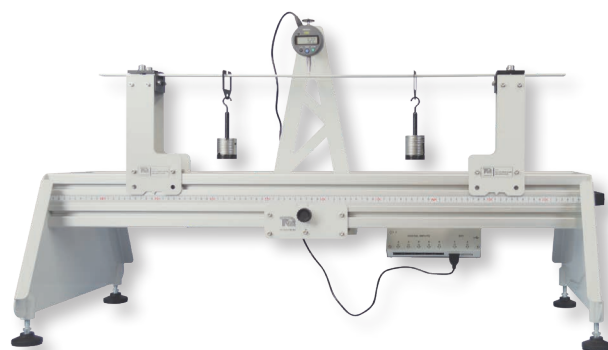
≡ SHEAR FORCE IN A BEAM STS3

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



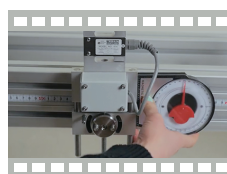
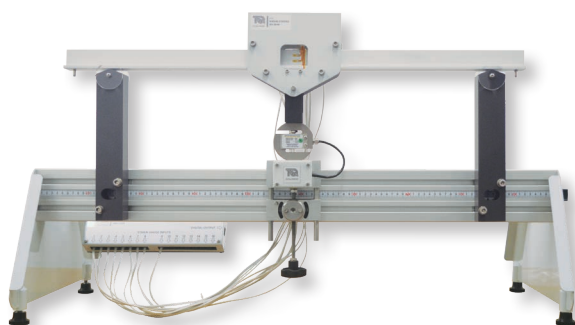
≡ DEFLECTION OF BEAMS AND CANTILEVERS STS4

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.



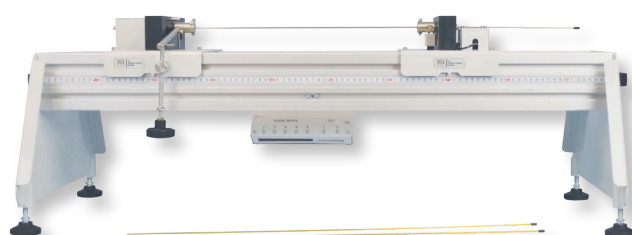
BENDING STRESS IN A BEAM EXPERIMENT



EXAMINING THE LOAD AND STRAIN GAUGE RELATIONSHIP

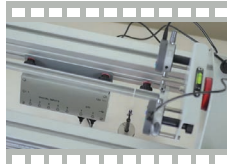
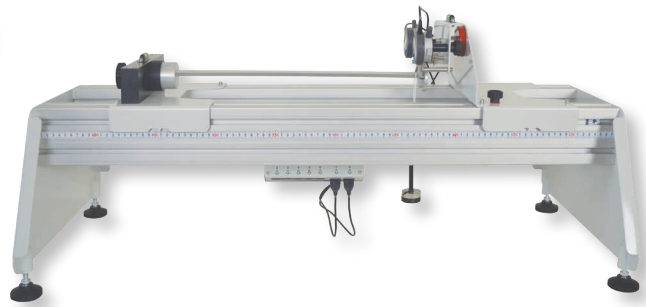
≡ TORSION OF CIRCULAR SECTIONS STS6

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.



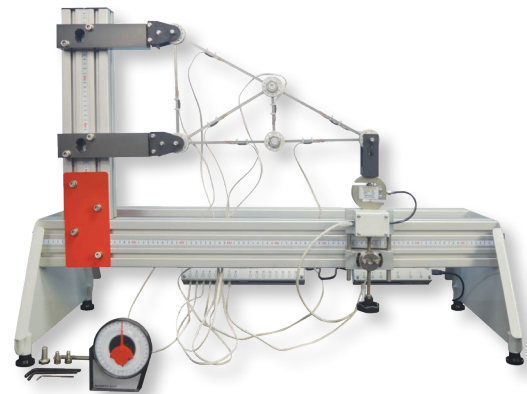
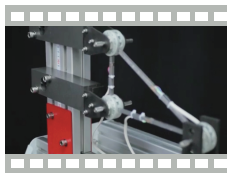
UNSYMMETRICAL BENDING AND SHEAR CENTRE



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.



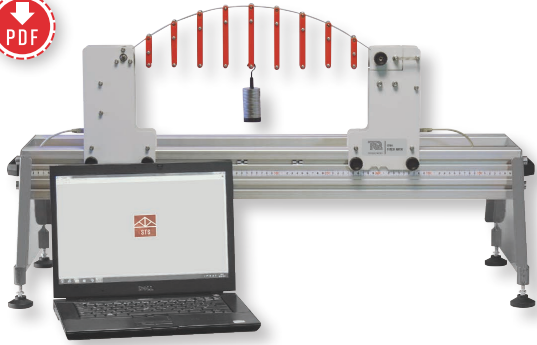
≡ TWO-PINNED ARCH STS10

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



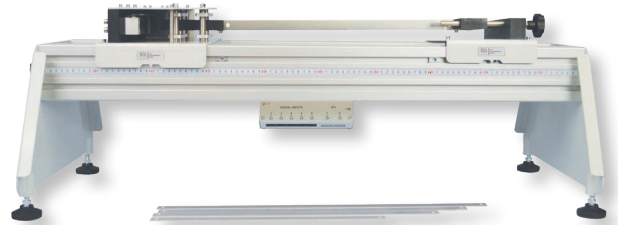
≡ FIXED ARCH STS11

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



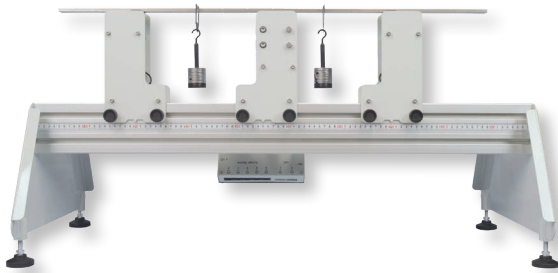
≡ EULER BUCKLING OF A COLUMN STS12

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

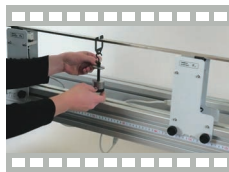


≡ CONTINUOUS AND INDETERMINATE BEAMS STS13

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



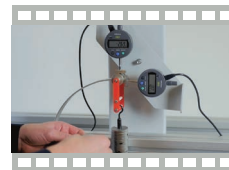
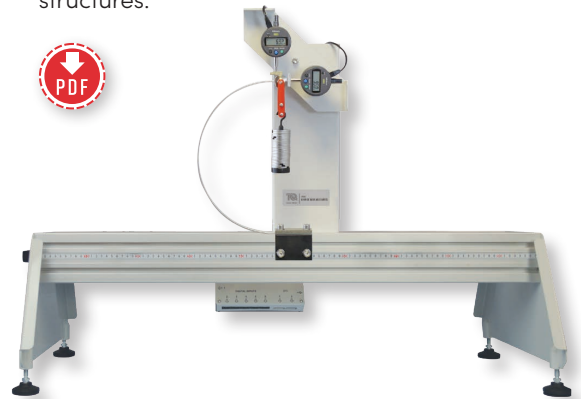
CONTINUOUS AND INDETERMINATE BEAMS EXPERIMENT



EXAMINING THE CENTRAL LOAD POINT

≡ CURVED BARS AND DAVITS STS14

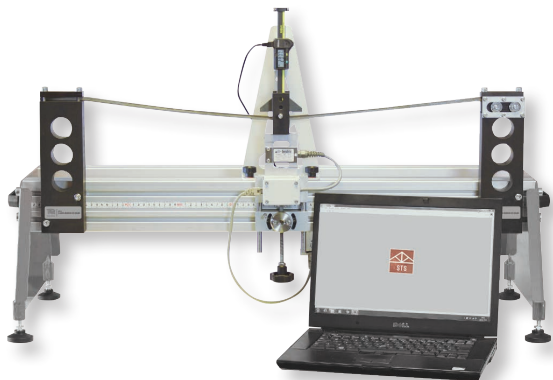
Experiment for investigations into two common curved structures and two common davit structures.



DEFLECTION OF CURVED BARS AND DAVITS



CURVED BARS AND DAVITS EXPERIMENT



≡ PLASTIC BENDING OF BEAMS STS15

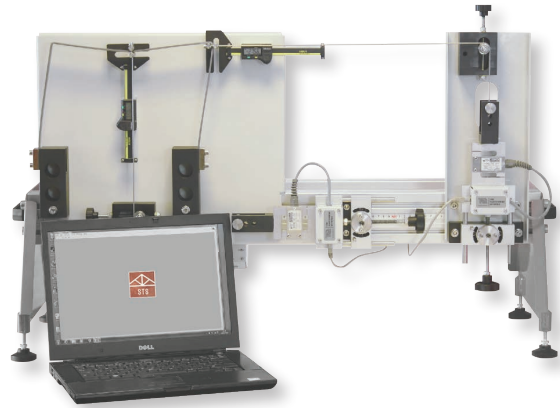
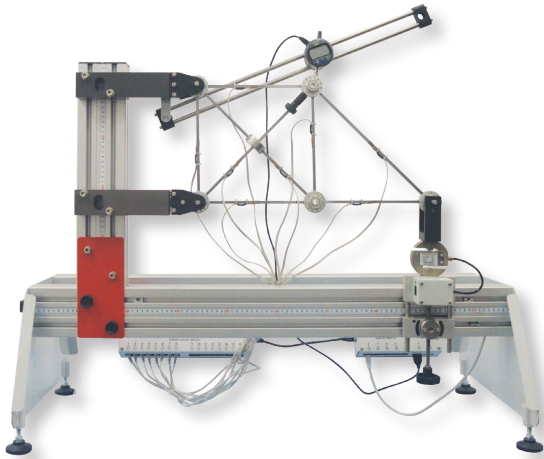
Experiment for the study of plastic theory and limit state design of beams.



PLASTIC BENDING OF PORTALS

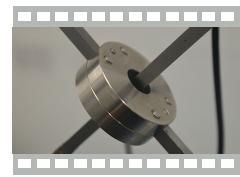
STS16

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



REDUNDANT TRUSS STS17

Experiment for the study of determinate and indeterminate truss structures.



FRAME DEFLECTIONS AND REACTIONS STS18

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



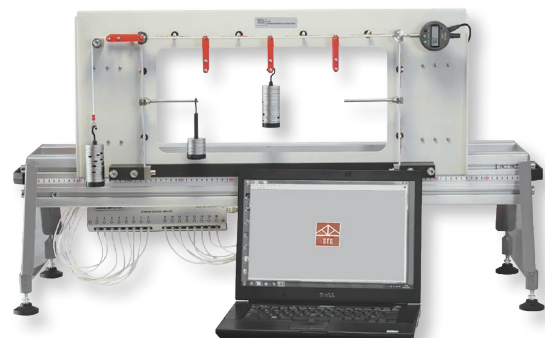
SIMPLE SUSPENSION BRIDGE STS19

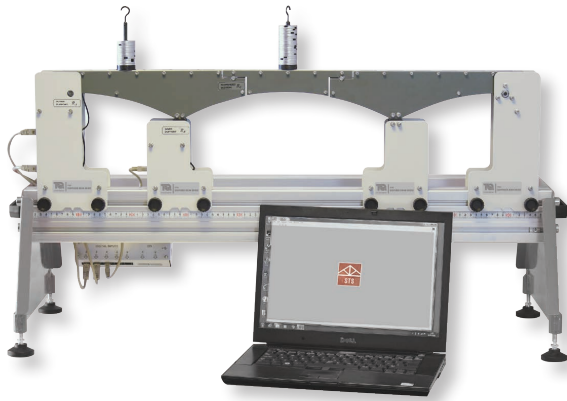
Experiment for the study of the characteristics of a simple suspension bridge.



BENDING MOMENTS IN A PORTAL FRAME STS20

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





≡ SUSPENDED BEAM BRIDGE

STS21

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



≡ EQUILIBRIUM OF A SIMPLY SUPPORTED BEAM STS22

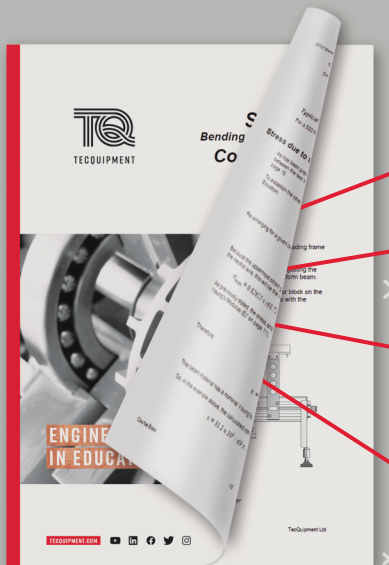
Experiment for the study of the characteristics of a simply supported beam.



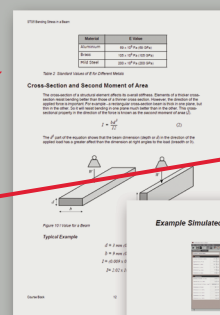
NEXT GENERATION STRUCTURES

DIGITAL STUDENT COURSE BOOKS

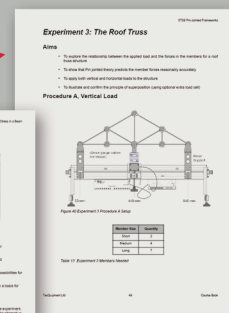
- Relevant theory
- Experiments with step-by-step instructions
- Simulated experiment
- Useful videos
- Easy to use on all platforms



THEORY



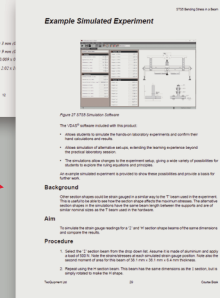
EXPERIMENTS



VIDEOS



SIMULATED EXPERIMENT



THEORY OF MACHINES

FRICTION
MOTION
VIBRATION



THEORY OF MACHINES

≡ 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

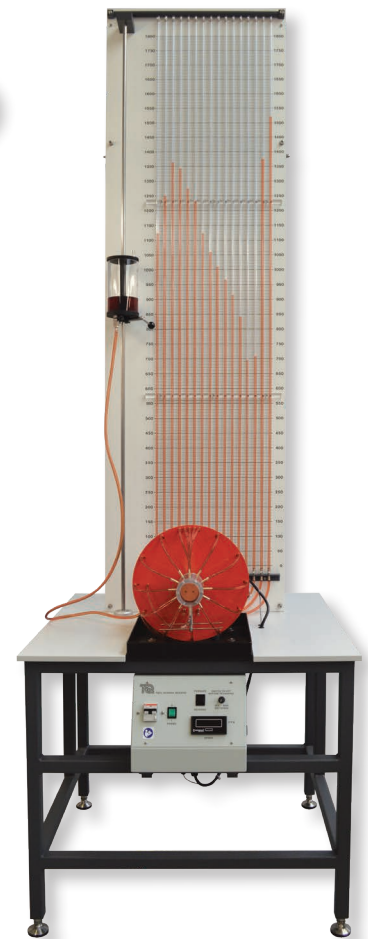
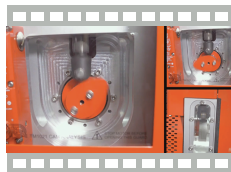
Floor-standing apparatus for demonstrating the pressures around a journal bearing at different speeds.



CAM ANALYSIS MACHINE TM102IV

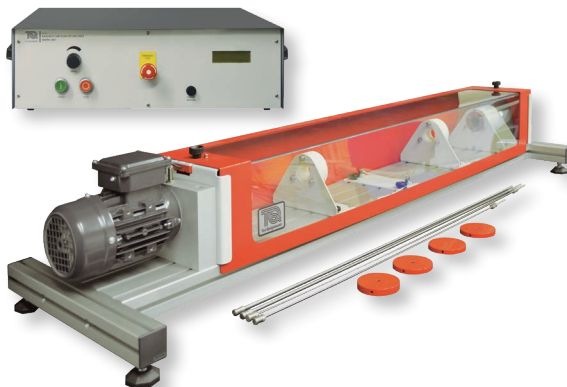
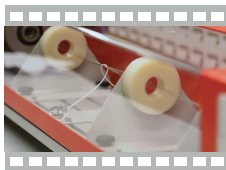


Benchtop apparatus and control and instrumentation unit, for studying the dynamic behaviour of different cams and followers and their 'bounce' speed.



WHIRLING OF SHAFTS AND CRITICAL SPEED TM100I

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

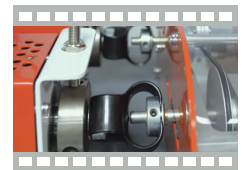


GEARED SYSTEMS TM1018

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.

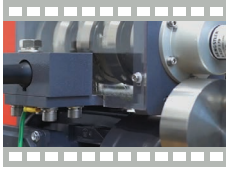
EXPERIMENT MODULES:

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



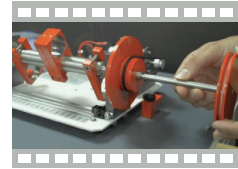
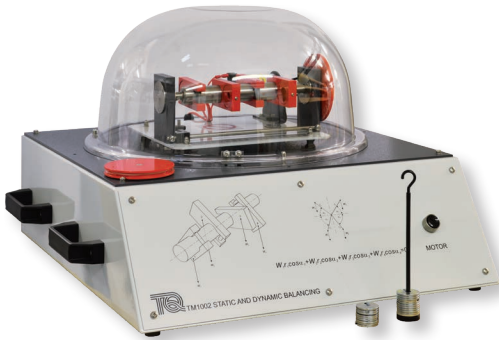
≡ BALANCE OF RECIPROCATING MASSES TM1022V **VDAS**®

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



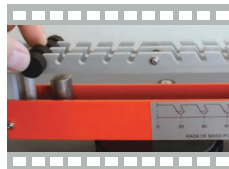
≡ STATIC AND DYNAMIC BALANCING TM1002

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



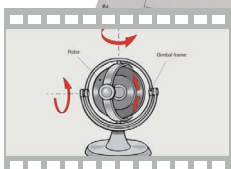
≡ CENTRIFUGAL FORCE TM1005 **VDAS**®

Benchtop apparatus for experiments in centrifugal force and angular velocity.



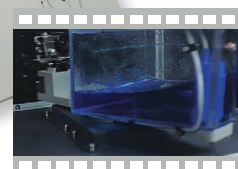
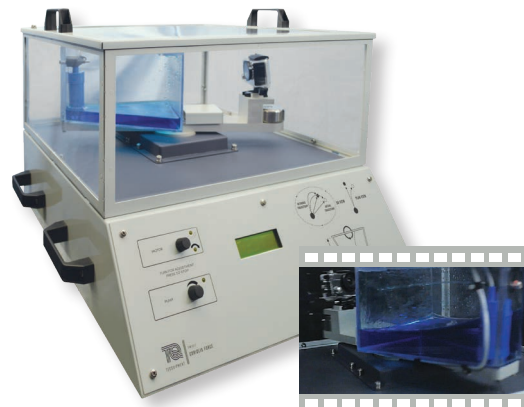
≡ GYROSCOPE TM1004 **VDAS**®

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



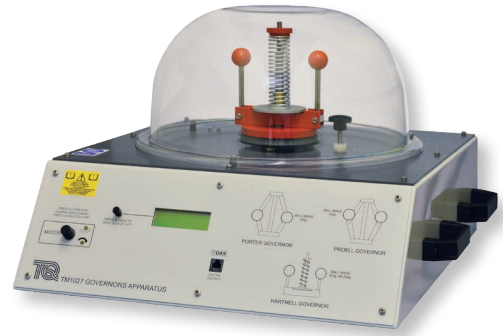
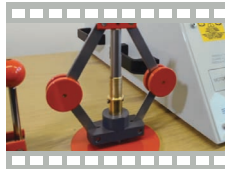
≡ CORIOLIS FORCE TM1017

Benchtop apparatus for demonstrations and experiments in Coriolis force.



GOVERNORS TM1027

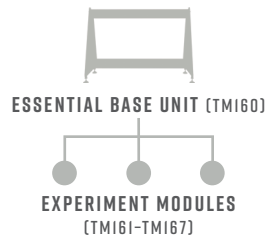
Benchtop apparatus for demonstrating how different governors work, including Hartnell, Porter and Proell governors.



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**®



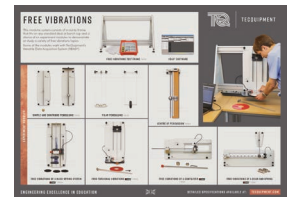
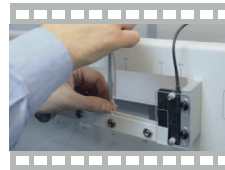
Free Torsional Vibrations (TM165) **VDAS**®



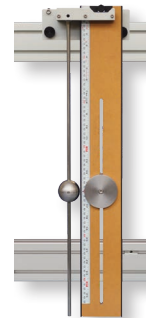
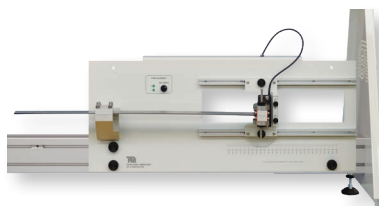
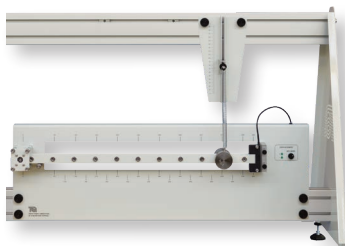
Free Vibrations of a Cantilever (TM166) **VDAS**®



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



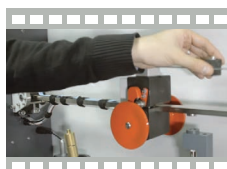
EXPERIMENT MODULES POSTER



FREE AND FORCED VIBRATIONS

TM1016V **VDAS**®
ONBOARD

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

STEAM

COMPRESSORS



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

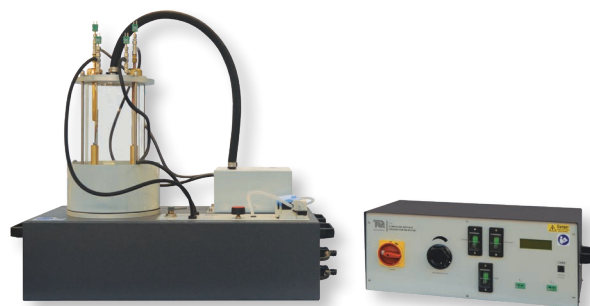
TD1004V **VDAS**®
ONBOARD

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



FILMWISE AND DROPWISE CONDENSATION AND BOILING TE78

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



EMISSION - NATURAL CONVECTION AND RADIATION TD1011V

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 

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**

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)



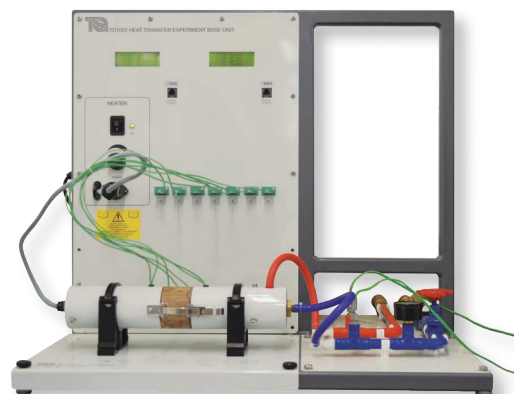
Radial Heat Conduction Experiment (TD1002b)



Extended Surface Heat Transfer Experiment (TD1002c)



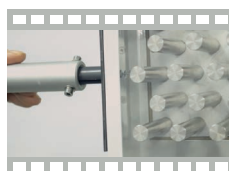
Conductivity of Liquids and Gases Experiment (TD1002d)



BASE UNIT FITTED WITH THE LINEAR HEAT CONDUCTION EXPERIMENT

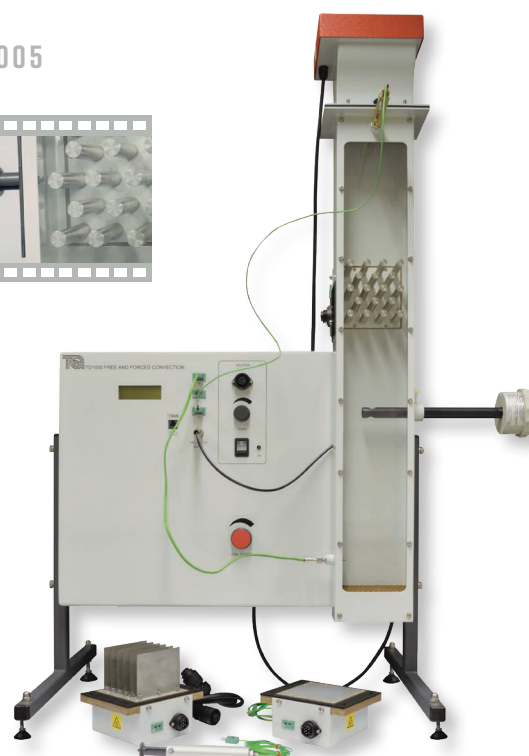
FREE AND FORCED CONVECTION TD1005

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



HEAT EXCHANGER SERVICE MODULE TD360 **VDAS**

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 four associated experiments.



BASE UNIT FITTED WITH THE PLATE HEAT EXCHANGER AND VDAS

EXPERIMENT MODULES:



Concentric Tube Heat Exchanger (TD360a)



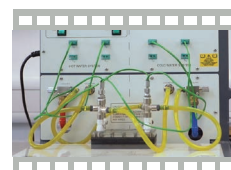
Plate Heat Exchanger (TD360b)



Shell and Tube Heat Exchanger (TD360c)



Jacketed Vessel with Coil and Stirrer (TD360d)

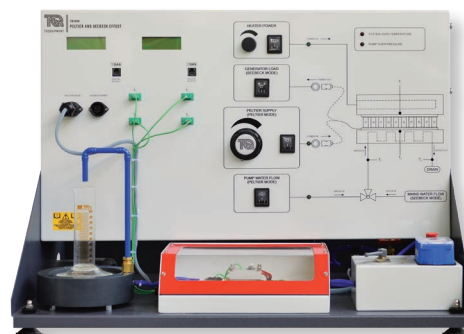




PELTIER AND SEEBECK EFFECT

TD1008 **VDAS**®

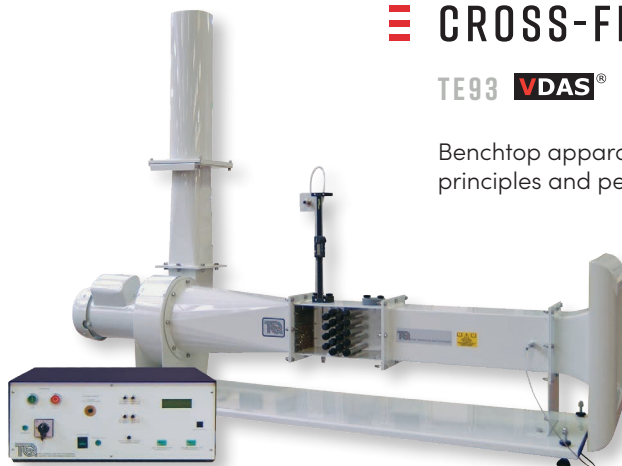
Benchtop apparatus that examines the performance of a thermoelectric device when connected for Peltier heat pump or Seebeck exchanger.



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

TD1003 **VDAS**®

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

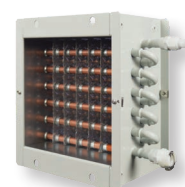


WATER-TO-AIR HEAT EXCHANGERS **TD1007** **VDAS**®

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.



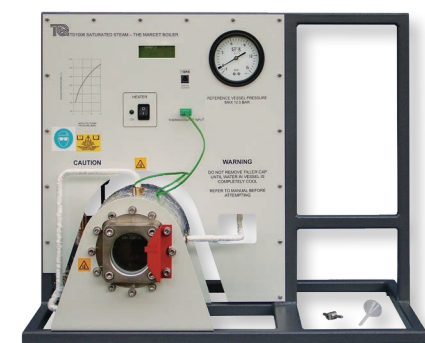
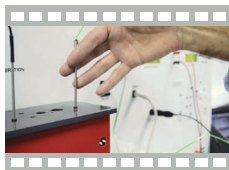
16-TUBE HEAT EXCHANGER



16-TUBE FINNED HEAT EXCHANGER

TEMPERATURE MEASUREMENT AND CALIBRATION TD400 VDAS®

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



SATURATED STEAM - THE MARCET BOILER TD1006 VDAS®

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



TWO-STAGE COMPRESSOR TEST SET

GT103

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



BOMB CALORIMETER TD500

This compact fuel calorimeter (bomb calorimeter) is for the hands-on investigation of energy gained from burning different fuels, either in liquid or solid form, within a safe, student-friendly contained receptacle.



ENGINES

INTERNAL COMBUSTION ENGINE TEST SETS

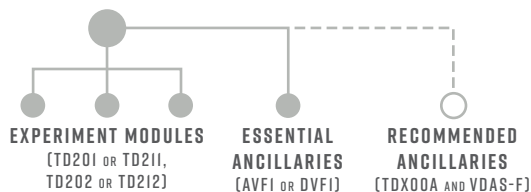
STEAM

GAS TURBINES

≡ SMALL ENGINE TEST SET TD200 **VDAS**®

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)



≡ AUTOMATIC VOLUMETRIC FUEL GAUGE WITH DIGITAL DISPLAY

DVFI **VDAS**®

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).

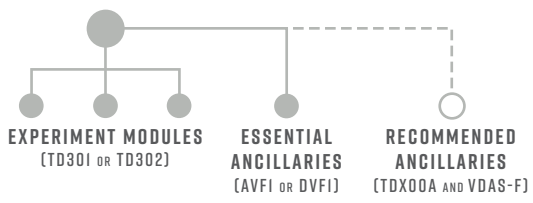


REGENERATIVE ENGINE TEST SET TD300 VDAS®

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.



ESSENTIAL BASE UNIT (TD300)



EXPERIMENT MODULES:



Four-Stroke Petrol Engine (TD301)

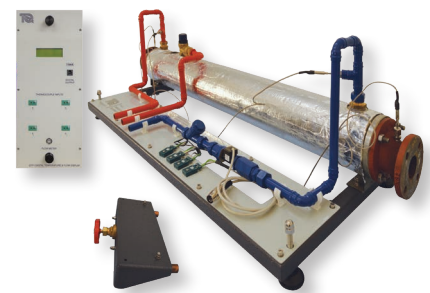


Four-Stroke Diesel Engine (TD302)

EXHAUST GAS CALORIMETER

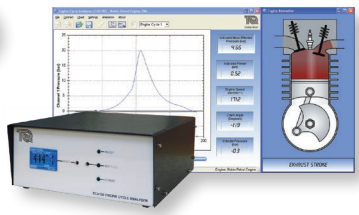
TDX00A VDAS®

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



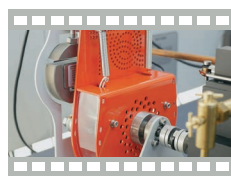
ENGINE CYCLE ANALYSER ECA100

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



THERMAL POWER PLANT WITH STEAM ENGINE TRAINER TD1050 VDAS®

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



≡ THERMAL POWER PLANT WITH STEAM TURBINE

TD1050V **VDAS**
ONBOARD

This laboratory-scale apparatus allows students to investigate the performance of a steam power plant, using a steam turbine to convert thermal energy into mechanical energy and then into electrical energy.



≡ 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.



PRODUCT DEVELOPMENT

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



≡ 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

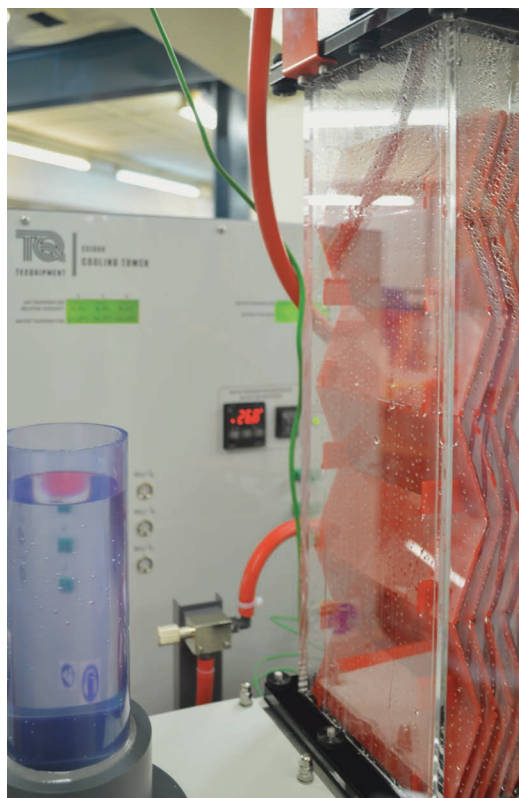
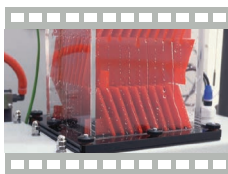
ENVIRONMENTAL CONTROL

COOLING TOWERS EC1000V **VDAS[®]** ONBOARD

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)



HUMIDITY MEASUREMENT TE6

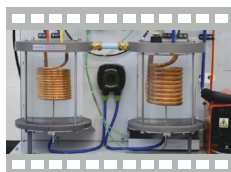
Benchtop apparatus that illustrates the principles of humidity measurement and compares various methods of measurement.



REFRIGERATION CYCLE

ECI500V **VDAS**
ONBOARD

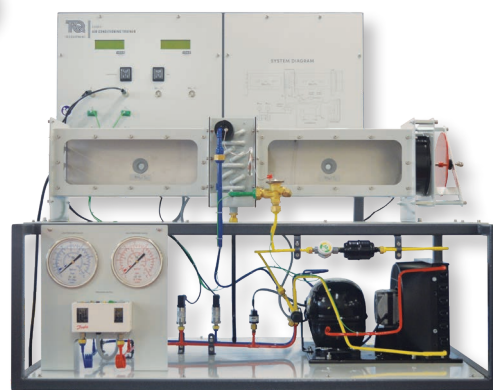
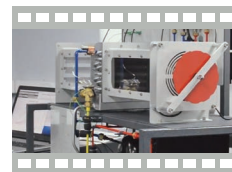
Benchtop apparatus that allows students to investigate and observe the stages of refrigeration, such as the coefficient of performance, superheat and subcooling.



AIR CONDITIONING TRAINER

ECI501V **VDAS**
ONBOARD

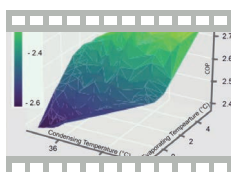
Benchtop apparatus that allows students to investigate the fundamental principles of air conditioning, including enthalpy change in the air flow.



ADVANCED HVAC & R TRAINER

ECI550V **VDAS**
ONBOARD

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

WIND

SOLAR PHOTOVOLTAIC

SOLAR THERMAL



ALTERNATIVE ENERGY

WIND TURBINE DYNAMICS

AE1005V **VDAS**
ONBOARD

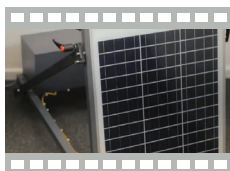
This is a versatile, compact apparatus for teaching the fundamentals of kinetic wind energy conversion into electrical power. Flexibility is at the core, it has a castor-mounted frame for mobility and functionality and allows students to 3D-print their own blades for advanced experimentation.



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.



☰ 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.



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

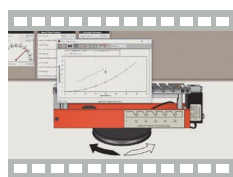


VERSATILE DATA ACQUISITION SYSTEM



VERSATILE DATA ACQUISITION SYSTEM (VDAS®)

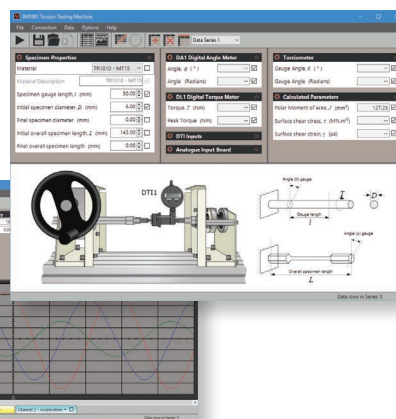
VDAS® is a high capacity, accurate, efficient and user-friendly automatic data acquisition hardware and software package that works with a growing list of over 60 TecQuipment products, enabling real-time display and capture of experiment data.



VDAS® FAMILIARISATION



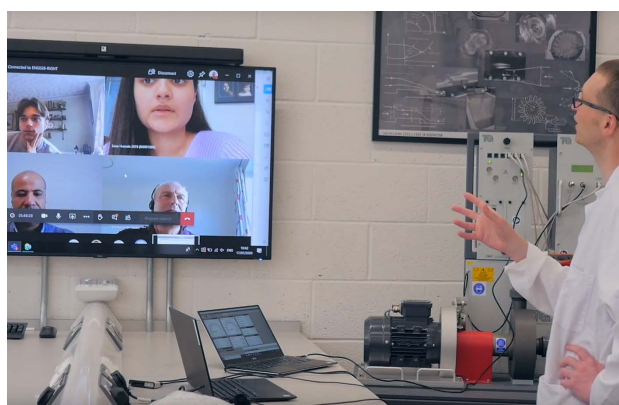
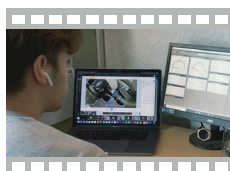
VDAS®



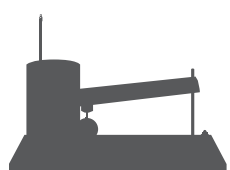
A REMOTE WORKING SOLUTION: VDAS® e-lab

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



LABORATORY

REMOTE WORKING STUDENTS

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 or contact our expert Sales team.

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NEWS

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≡ CONTACTING TECQUIPMENT

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For all purchase enquiries please contact the local agent or:
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Purchase enquiries can be:

- Requests for data sheets, catalogues and further information
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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.

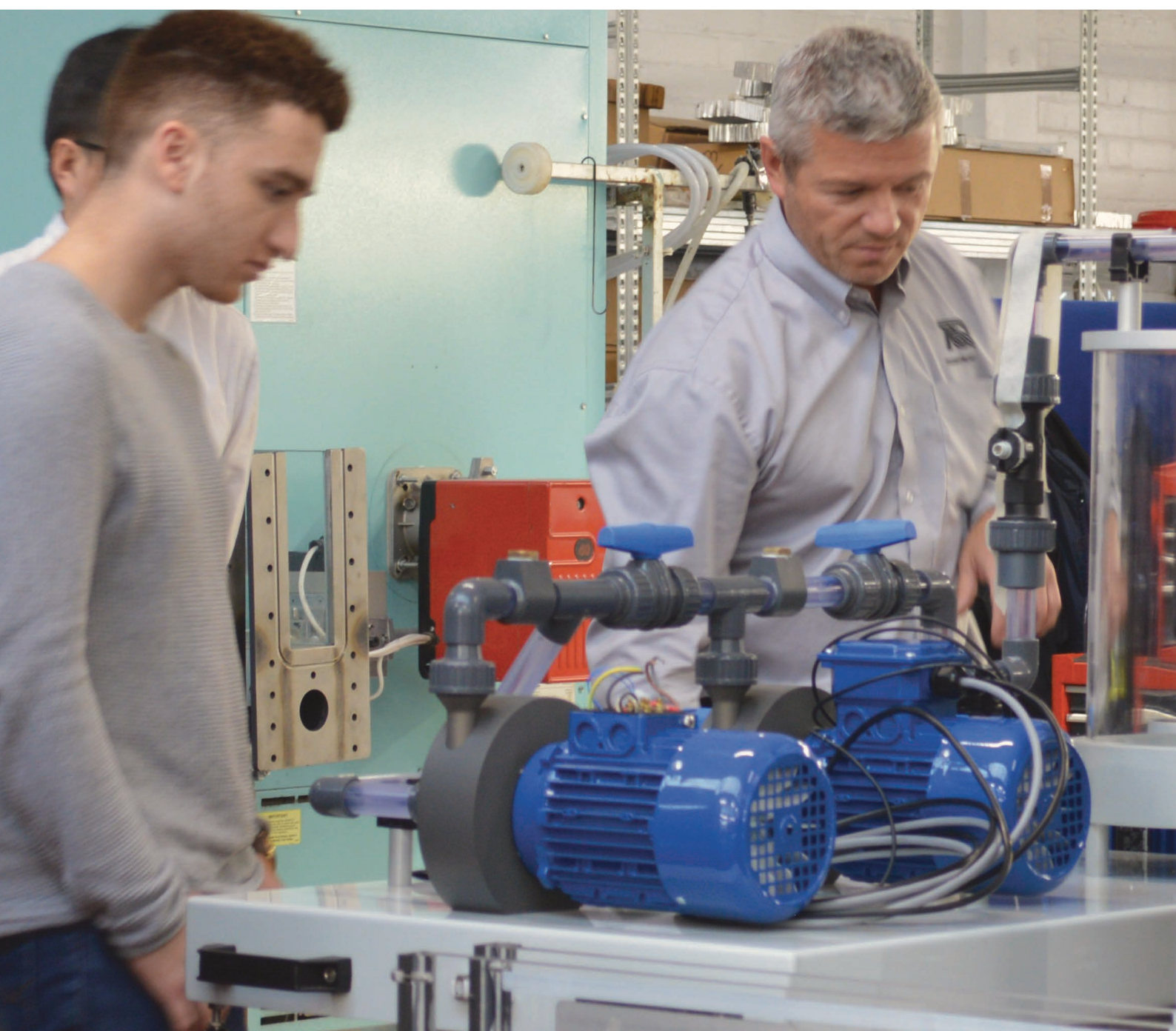
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- Requests for manuals and user guides
- Quotations for spares and consumables
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≡ CASE STUDY

TIDAR UNIVERSITY IN JAVA ADDRESSES THE CIVIL ENGINEERING SKILLS GAP IN INDONESIA

Students on the Civil Engineering study programme at TIDAR University in Java, Indonesia are now benefiting from the installation of a range of new fluid mechanics practical teaching apparatus from TecQuipment for understanding water resources engineering.

There is a shortage of civil engineers in Indonesia, particularly those that have the necessary expertise to support the growth of the infrastructure required within the country. Universities like TIDAR have been raising the standards of education using a competency-based curriculum that meets the requirements of the Indonesian National Qualifications Framework (KKNI). An important element of this is teaching using practical didactic



methods. After putting the project for fluid mechanics practical teaching equipment out to tender, they opted to purchase the teaching equipment from TecQuipment, working with Jitrasindo, TecQuipment's specialist provider within the country.

The Civil Engineering programme at TIDAR University covers the design, construction, renovation, operation and maintenance of

buildings. The recently acquired equipment from TecQuipment focuses on the water resources engineering element of the teaching syllabus, covering flow and pressure measurement, laminar and turbulent flow, open channel flow, hydrology, hydrostatics and properties of fluids.



EAST TENNESSEE STATE UNIVERSITY EXPANDS ENGINEERING LABORATORY FACILITIES



East Tennessee State University, which has a history of teaching engineering technology dating back to the 1930s, made the decision to expand the course offering in 2015 to include a BSc in General Engineering which combines courses from mechanical, civil and electrical engineering. To teach the course they needed an engineering laboratory that had equipment to practically teach the principles of civil and mechanical engineering. There were existing electrical engineering laboratories, to serve the BSc, in the electrical engineering technology programme. After going out to bid, TecQuipment won, based on a balance between price and functionality of equipment.

With a complete basement floor renovation, new equipment from TecQuipment and the installation of high-tech classroom equipment, the floor now boasts to be one of many high-tech laboratories within the university.

DATA ACQUISITION CAPABILITIES

TecQuipment's own data acquisition system, VDAS®, is available on many of the company's products, and provides real time data display and capture, with real-time calculation of equipment-specific variables, and data charting with fast and easy data export.

"TecQuipment is one of the few providers of engineering teaching equipment that integrate all the data acquisition into their products, making it easier to draw out data from the experiments. This was one of the various reasons which made us choose TecQuipment over others in the industry," commented Professor J Paul Sims, Director of the BSc General Engineering degree programme.

Just the right amount of interaction

"TecQuipment's products also lend themselves very well to student manipulation in the laboratory. Similar equipment in the market made it too easy, like a cook book. It's important for the students to interact, to get the full learning benefit," added Professor Sims.

All TecQuipment products come with a detailed user guide, which includes sample experiments. These set guidelines provide a great starting point for embracing the theories in focus. The equipment has the flexibility to be used beyond these set examples, some of which you can find illustrated by students on TecQuipment's YouTube channel.

THE LABORATORY SET-UP

For the practicals required for the General Engineering degree, the team selected a range of Thermodynamics, Fluid Mechanics and Engineering Science range equipment from TecQuipment.

THERMODYNAMICS included:

- A **SMALL ENGINE TEST SET** (TD200) that acts as a base unit for attaching a modified four-stroke petrol engine and modified four-stroke diesel engine, plus a frame-mounted VDAS® unit (Versatile Data Acquisition System). Used with a Manual Volumetric Fuel Gauge (AVF1), Crank Angle Shaft Encoder (ECA102) and Engine Cycle Analyser (ECA100), students can investigate the thermodynamic cycle of each of the engines, and explore variables, including mean effective pressure and indicated power, the mechanical efficiency, and carry out combustion analysis, plus much more.

"This product is a great example of how TecQuipment balances the right level of student interaction with the equipment to improve the learning experience. From putting the fuel in, and physically pulling the manual starter on the motor, to making adjustments to the needle valve and throttle to take readings and carry out performance comparisons within VDAS®," added Professor Sims.



A video of a student using this test set illustrates Professor Sims's points: [YOUTUBE.COM/WATCH?V=YKIG8NT7PEE](https://www.youtube.com/watch?v=YKIG8NT7PEE)

- A **WATER-TO-AIR HEAT EXCHANGERS** (TD1007) experimental unit for learning how cross-flow water-to-air heat exchangers work, plus frame-mounted VDAS® that allows them to complete tests quicker and make the recording of results easier. For comprehensive teaching on the topic, they also purchased the 16-tube heat exchanger and 16-finned heat exchanger ancillaries.
- **THE HEAT TRANSFER EXPERIMENT BASE UNIT** (TD1002), Linear Heat Conduction Experiment (TD1002a) and versatile data acquisition was selected together for teaching the fundamentals of heat transfer.

FLUID MECHANICS included:

- A **DIGITAL HYDRAULIC BENCH** (H1F) which is the base unit that supplies, recirculates and measures water for flow pressure and measurement experiments including:
- **DISCHARGE OVER A NOTCH** (H6) for studying weirs for flow regulation and measurement, and the Flow Measurement Methods (H10) apparatus for measuring the effectiveness and comparisons on and between the Venturi meter, orifice plate and rotameter of an incompressible fluid. Plus a couple of different turbines: the Pelton (H19) and Francis (H18) turbine.

- A **LOSSES IN PIPING SYSTEMS** (H16) apparatus for investigating the friction losses in different types of piping systems (straight, bends, valves, elbows, sudden contraction and sudden expansion).
- A **CENTRIFUGAL PUMP TEST SET** (H47) apparatus for teaching students about centrifugal pump performance. For clear pressure display, the team opted for an Analogue Pressure Display (AP1) ancillary and frame-mounted VDAS® to fit on the instrumentation frame of the test set.

ENGINEERING SCIENCE included:

- Two **ENGINEERING SCIENCE WORK PANELS** (ES1), along with two experiments: a Pulley Kit (ES10) and a Gear Trains Kit (ES13).

Another key point for the BSc programme was the ability to integrate VDAS® with LabVIEW. Both the Engineering Technology and Engineering programmes use LabVIEW in most laboratories to support student development and provide students with a working knowledge of LabVIEW, which is a standard industrial platform for control and monitoring of processes.

INSTALLATION AND TRAINING

In major installation cases, TecQuipment personnel will often be sent out to site to help with the commissioning and training of products.

"After the customer service installation I feel very confident. The products are straight forward and the user manuals are great!" explained Assistant Professor Samia Afran. "I came prepared with a whole blank notebook to document all that TecQuipment's applications engineer was going to train me on. But I didn't need to write anything, it was all in the provided documentation."

LOCAL SALES AND SUPPORT

TecQuipment works with partner companies across the world that specialise in understanding the local engineering education institutions and delivering products that best match their teaching requirements. In this case, local partner for Tennessee, RELETECH, had proven themselves before the bid even came in. "We trust the team from RELETECH, and TecQuipment too. This established relationship gave us extra conviction in knowing that the bid process had selected the rightful vendor to work with," added Professor Sims.





INTERACTIVE
DIGITAL VERSION

Front cover: Vortex Apparatus (H13)

Inside front cover: Process Trainer (CE117)

Back cover: Fluid Friction Apparatus (H408) with student from York College of Pennsylvania, USA